

CANMET

Canada Centre for Mineral and Energy Technology
Centre canadien de la technologie des minéraux et de l'énergie



INDEX OF MINING TECHNOLOGY PROJECTS

RÉPERTOIRE DE PROJETS EN TECHNOLOGIE MINIÈRE

1996

**MINING AND MINERAL SCIENCES LABORATORIES/
LABORATOIRES DES MINES ET DES SCIENCES MINÉRALES
MMSL 96-025(TR)E&F**



Natural Resources
Canada

Ressources naturelles
Canada

Canada

**INDEX OF MINING TECHNOLOGY PROJECTS
RÉPERTOIRE DE PROJETS EN
TECHNOLOGIE MINIÈRE**

1996

A. Boyer, R. Gaëtan, C. Potvin & I. Lafferty

**Office of Business Development
Bureau de développement commercial**

September/Septembre 1996

**Mining and Minerals Sciences Laboratories
Laboratoires des mines et des sciences minérales**

REPORT MMSL/RAPPORT LMSM 96-025 (TR) E & F

FOREWORD

In the mid-1980s, at the request of the Minister's National Advisory Committee to CANMET (MNACC), the Mining Research Laboratories (MRL) established a database on the mining technology projects being undertaken in Canada.

The organizations featured in the database are regularly contacted to update their information. At the same time, other organizations in the minerals industry are canvassed periodically to obtain their participation, in order to make the scope as broad as possible.

The index of Mining Technology projects is unique in that it is the ONLY comprehensive source of information on the mining research and development projects currently being carried out in Canada by companies, universities, federal and provincial agencies, and private sector organizations. An important aspect of the Index is that the majority of the projects listed are not documented in technical magazines, journals and proceedings, or elsewhere in the literature. The Index, therefore, provides technical reference information that complements published R&D work.

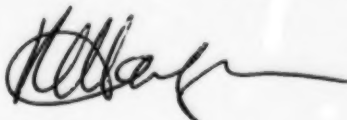
In Section 1 of the Index, projects are listed by organization, whereas in Section 2 projects are listed by subject category. This format has been well received. CANMET has been complimented both on the usefulness of the Index and on the manner in which the information is classified and presented.

We hope that the willingness of companies, to share technical information, will continue since we are convinced that such participation can contribute to increased productivity and greater international competitiveness for the Canadian mining industry.

Once again, we suggest that those receiving this Index circulate it widely amongst their technical staff and colleagues. We believe that there are still many potential users who do not fully benefit from this source of information.

Finally, I would like to thank all those who contributed to the 1996 version of the Index, and to ask for their continued support, in the preparation of the 1997 Index.

Robert Hargreaves
Director
Mining and Mineral Sciences Laboratories



AVANT-PROPOS

À la demande du Conseil consultatif national du Ministre pour CANMET (CCNMC), les Laboratoires de recherche minière (LRM) ont mis sur pied, vers le milieu des années 1980, une base de données sur les projets en technologie minière entrepris au Canada.

Les organisations présentées dans cette banque de données sont contactées régulièrement pour mettre à jour leur contribution. Cependant, d'autres organismes de l'industrie minière sont invités à participer pour ainsi permettre un éventail d'information le plus grand possible.

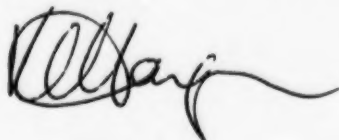
Ce Répertoire est UNIQUE, il contient des renseignements sur les projets de recherche et de développement actuellement réalisés par des sociétés minières, des universités, ainsi que des organismes des gouvernements fédéral et provinciaux et du secteur privé. Il faut également souligner que la plupart des projets du Répertoire ne sont pas documentés dans les magazines ou autres publications techniques.

Dans la Section 1 du Répertoire, les projets sont regroupés par organisme tandis que dans la Section 2, ils le sont par sujet. Ce format a été bien accepté si l'on se fonde sur les commentaires positifs qu'a reçus CANMET sur l'utilité du répertoire et sur la façon dont sont présentées et classifiées les données.

Nous espérons que les sociétés et autres organisations-ressources continueront à partager leurs renseignements techniques car nous sommes convaincus que cette participation peut contribuer à augmenter la productivité et la compétitivité de l'industrie minière canadienne sur les marchés internationaux.

Une fois de plus, nous espérons que le répertoire circulera plus largement au sein de personnel technique des sociétés et des organismes de R et D, étant donné qu'il existe sûrement des utilisateurs possibles qui ne bénéficient pas encore de cette source d'information.

Enfin, j'aimerais remercier tous ceux qui ont contribué à la version 1996 du Répertoire et je les invite à continuer d'accorder leur appui à la préparation du Répertoire de 1997.



Robert Hargreaves
Directeur
Laboratoires des mines et sciences minérales

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INTRODUCTION

The majority of Canadian Mines are not located near urban centres, where there is usually easy access to sources of technical information at libraries, universities, government agencies and professional associations. This remoteness often makes keeping abreast of technology changes difficult and, consequently, these mines sometimes find themselves "re-inventing the wheel". If the latter can be avoided, overall mining costs can be reduced for the benefit of the mine and also the national economy.

The Index of Mining Technology projects is aimed at being an information system that would promote communications between operators and other segments of the industry on technology development projects.

The Index enables someone interested in a particular project or technology to contact the organization performing the work, without channelling their inquiry through CANMET. The amount of information divulged in such an inquiry is dependent on the two parties concerned, therefore, the usefulness of the Index depends entirely on the participation of the people and organizations using it. We trust, that the inclination of companies to share technical information will continue to grow in the future, as this is one vital way to improve the productivity and international competitiveness of the Canadian mining industry.

The projects are classified into 13 categories. While it was realized that it is difficult to group all the projects within these 13 categories, it was however decided to keep the 13 categories grouping in order to not make cumbersome the compiling of the projects.

Without question, the management and staff at the majority of mining properties see the advantages of changing one or more aspects of their operations, to improve productivity and lower costs per unit mined. Other advantages of technology change include improved health and safety, better environmental controls and enhanced methods for resource conservation, to name a few.

Whatever the circumstances, most operators are trying to incorporate new technological concepts into their mine operations. Although similar, no two operations are exactly alike and therefore, ideas implemented in one mine often cannot be used in another without some modification and, as a result, nearly every operator must undertake some original thinking on such matters. We believe that a publication such as the Index can help this process with its' listing of technically related projects which, in the majority of cases, cannot be found in technical publications or regular commercially available technical databases.

The "Index" was compiled by grouping the information received during the Fall of 1995 - Winter 1996, through mail exchanges. The Index carries information on current mining projects realized by industry, universities and various research centres.

The Mining and Mineral Sciences Laboratories (MML) Division does not possess detailed information on non CANMET projects listed in the Index. For this information, readers should contact the persons listed on the appropriate pages in Section 1 of the Index.

INTRODUCTION

La plupart des mines canadiennes sont éloignées des centres urbains. C'est pourquoi les exploitants miniers n'ont pas toujours accès aux sources d'information technique que sont les bibliothèques, universités, organismes gouvernementaux et associations professionnelles. De nombreux exploitants trouvent donc difficile de suivre les progrès accomplis en matière de technologie, d'équipements et d'exploitation et se retrouvent souvent à "réinventer la roue". Un tel dédoublement d'activités nuit à la situation financière de l'exploitation ainsi qu'à l'économie nationale en plus de constituer une dépense inutile pour tout exploitant, en particulier lorsque le prix des métaux sont relativement bas et instables, que la concurrence nationale et internationale s'accroît et que les coûts de production augmentent rapidement.

Le répertoire de projets en Technologie minière se veut un outil d'information pour faciliter les communications entre les exploitants, et les autres segments de l'industrie en matière de projets de développement Technologique.

Les projets sont classés en treize groupes. Quoiqu'il a été réalisé qu'il est difficile de grouper les projets avec seulement treize groupes, il a tout de même été décidé de rester avec lesdits treize groupes, question de ne pas alourdir la compilation des projets.

Il va de soi que la direction et le personnel de la plupart des propriétés minières reconnaissent les avantages de modifier un ou plusieurs aspects de leurs exploitations, d'améliorer leur productivité et de diminuer leurs coûts d'extraction unitaires. Parmi les autres avantages liés aux changements techniques, mentionnons l'amélioration de la santé et de la sécurité, la diminution de la pollution environnementale, et l'amélioration des méthodes de protection des ressources, pour n'en nommer que quelques-uns.

Quelles que soient les circonstances, la plupart des exploitants tentent d'intégrer de nouveaux concepts technologiques dans leurs exploitations minières. Bien qu'il existe des exploitations semblables, il n'y en a pas qui soient suffisamment identique à d'autre pour que les concepts mis en oeuvre dans l'une puissent être appliqués à l'autre sans être modifiés. C'est pourquoi, tout exploitant doit considérer d'entreprendre des travaux de recherche qui lui sont propres dans ce domaine. Le répertoire est donc une publication pouvant faciliter ce processus en énumérant les projets techniquement connexes qui, dans la plupart des cas, ne sont pas mentionnés dans les publications techniques ou les bases de données techniques commerciales.

Le présent répertoire a été compilé en regroupant les renseignements recueillis au cours de l'automne 1995 - hiver 1996 par le biais d'échanges par courrier. Le répertoire contient des renseignements sur les projets miniers actuellement réalisés par l'industrie, les universités et diverses agences de recherche.

Le répertoire permet à l'utilisateur intéressé, dans un type particulier de projet ou de technologie, de contacter l'organisation impliquée dans le projet, sans passer par CANMET. La quantité d'information divulguée entre les partis dépend de ceux-ci. C'est pourquoi, l'utilité de Répertoire est liée entièrement à la participation des personnes et des organisations.

Il est à noter que CANMET ne possède pas de renseignements détaillés sur les projets énumérés dans le répertoire. Pour obtenir de plus amples renseignements, le lecteur doit s'adresser à la personne dont le nom est donné à la page appropriée de la première partie du répertoire.

CANMET

Index of Mining Technology Projects

Répertoire de projets en technologie minière

STATISTICS ON INDEX MINING PROJECTS/

**STATISTIQUES SUR LES PROJETS
DU RÉPERTOIRE**

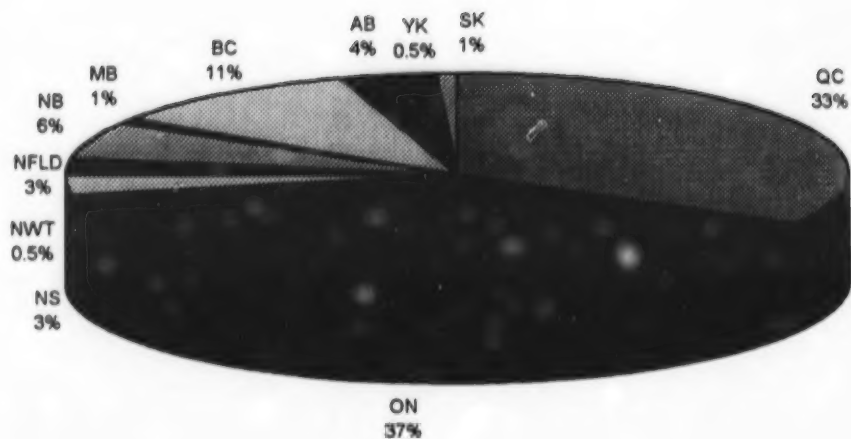


Fig. 1
Projects by Province/Projets par province

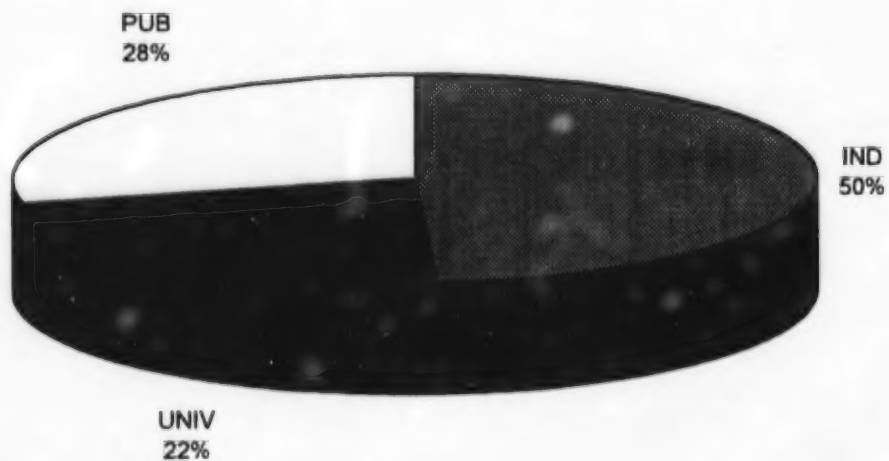


Fig. 2
Projects by Organization/Projets par Organisation

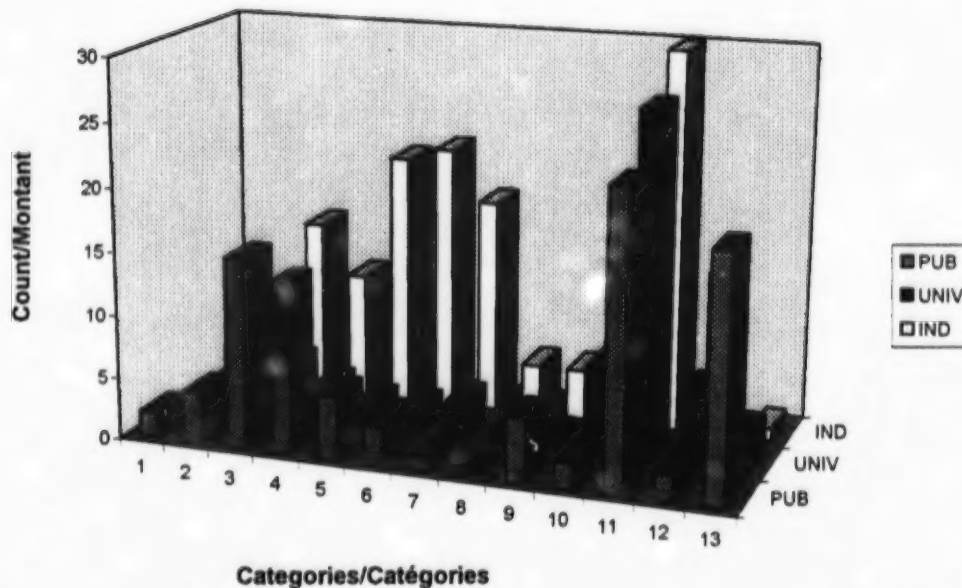


Fig. 3
Projects by Category/Projets par Catégories

PROJECT CATEGORIES / CATÉGORIES DE PROJET

1 Management Administration	2 Feasibility Faisabilité	3 Surface Technology Technologie de surface	4 Design Conception
5 Equipment Équipement	6 Development Développement	7 Production Production	8 Materials Handling Manutention des Matériaux
9 Services Services	10 Rock Properties Propriétés du roc	11 Ground Control Soutènement	12 High Tech Technologie de pointe
13 Health & Safety Santé & sécurité			

SECTION 1

**PROJECTS LISTED BY ORGANIZATION/
LISTE DES PROJETS PAR ORGANISATION**

Agnico-Eagle Ltée
Division Joutel
C.P. 310
Joutel, QC
JOY 1N0

AgEa

Project Title / Titre du Projet**Category /
Catégorie**

Jacques Gauthier, ing.
Directeur de projet

Phone (819) 756-2451
FAX: (819) 756-2744

Projet Vezze**2**

Fonçage du puits pour ré-approfondissement de 1112 pieds à 2430 pieds (740 mètres). Développements de 2 niveaux (550 et 650M) avec galerie d'exploration pour un programme de forage au diamant en profondeur et définition entre les niveaux 450 et 550 mètres. Ceci complète la phase II des travaux de mise en valeurs.

Agrium Inc.
Potash Operations
Vanscoy, SK
S0L 3J0

AgIn

Project Title / Titre du Projet**Category /
Catégorie**

A. Dave MacKintosh
Consultant

Phone (306) 668-4343
FAX: (306) 668-2003

Micro-Seismic Monitoring in a Surface Borehole**11**

The prospect consists of two triaxial phones were installed at depths of 950M and 650M to monitor mining induced micro-seismic events. An underground array of six phones provides event location in plan while attempts at locating in elevation are made using data from the borehole phones.

Alberta Research Council
P.O. Box 8330
250 Carl Clark Road
Edmonton, AB
T6H 5X2

AlRe

Project Title / Titre du Projet	Category / Catégorie
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Ralph Jonasson Associate Research Officer	Phone (403) 450-5043 FAX: (403) 450-5397
Sand Control (in oil wells)	7,12
Development of reversible plastic consolidation technology "In Situ Geotextiles" sub-project under AACI program (now CONRAD).	

Algoma Steel Inc.
Algoma Ore
Wawa, ON
POS 1K0

AlSt

Project Title / Titre du Projet**Category /
Catégorie**

A.L. Stevens
Manager

Phone (705) 856-2314 Ext. 4620
FAX: (705) 856-7006

Rehabilitation Sand Pit**3**

Rehabilitate an abandoned pit using materials from a steel company as fill. Site to be covered and seeded with grass.

The project is to prevent acid generation at the site.

Atomic Energy Control Board
Office of Public Information
P.O. Box 1046
Ottawa, ON
K1P 5S9

AeCb

Project Title / Titre du Projet	Category / Catégorie
--	---------------------------------

M.R. Avadhanula
Program Officer

Phone (613) 995-5894
FAX: (613) 992-2915

**Environmental Monitoring of Uranium Mining Waste Using
Geophysical Techniques - Phase II**

3

The purpose of this project is to confirm the results of the feasibility study (5.164.1) by re-surveying selected sampling areas where anomalies were found when geophysical survey techniques were applied to environmental monitoring of contaminant transport from uranium mining wastes (waste rock piles, tailings area, and special wastes disposal areas). Geophysical methods determine variations in physical properties through the measurement of various fields and waves including gravitational, electromagnetic, acoustic etc., which penetrate the earth. These measurements provide information on variations in the physical properties of the subsurface while being non-intrusive. For active as well as non-active sites, cost-effective monitoring techniques are needed. Because Acid Mine Drainage (AMD) investigations have traditionally relied on surface sampling, and drilling and sampling of the subsurface, the can be expensive and slow. In a suitable environment, geophysical methods offer the potential for rapid non-intrusive mapping of significant AMD problems. Geophysical methods have the potential to detect directly and to map sulphides, areas of active chemical oxidation, and problematic seepages. In turn, they can provide better siting for the installation of groundwater monitoring piezometers on an as-needed basis.

Atomic Energy Control Board
Office of Public Information
P.O. Box 1046
Ottawa, ON
K1P 5S9

Project Title / Titre du Projet**Category /
Catégorie**

V. Elagupillai
Program Officer

Phone (613) 995-5894
FAX: (613) 992-2915

Ontario Miners Mortality Study - Phase 5**13**

The purpose of this project is to update the mortality, exposure and smoking data of Ontario uranium miners for the period 1988 to 1994. This update will be used in a future study to improve the risk estimates of lung cancer related to exposure to radon progeny in this population.

The previous phases of the Ontario Miners Mortality Study have revealed that the update on an annual basis of mortality and histology data, as well as exposure and smoking histories, is useful for detecting any annual trend in the mortality pattern, and any influence of yearly variation of smoking habits on the incidence of lung and other cancers among the aging population of Ontario uranium miners. Furthermore, the annual update may be pooled together about every five years and the updating of risk estimates may be achieved with minimum delay and cost.

K.P. Ho
Program Officer

Phone (613) 995-5894
FAX: (613) 992-2915

Radiological Impact of Uranium Mining: Ontario - Phase 2**13**

The purpose of this project is to create a comprehensive computer database and transfer all the data collected in the Phase 1 (5.149.1) study in order to store and maintain environmental data from uranium mines in the future.

Atomic Energy Control Board
Office of Public Information
P.O. Box 1046
Ottawa, ON
K1P 5S9

AeCb

Project Title / Titre du Projet	Category / Catégorie
Analysis of Uranium Mine Workers Exposure Data	13
The purpose of this project is to provide AECB staff with the necessary tools to analyze uranium mine workers exposure data. A standard computerized readable format to be used by uranium mining companies to report occupational exposures will be defined, and the required software for the storage and analysis of these reports will be developed.	
Analysis of Saskatchewan Uranium Mines Environmental Data	3
The purpose of this project is to create the infrastructure necessary to analyze environmental data generated by Saskatchewan uranium mining facilities. This includes acquisition of computer hardware and generation of software that will enable AECB staff to perform compliance and statistical analyses of submitted environmental data in an efficient and timely manner.	

Atomic Energy Control Board
Office of Public Information
P.O. Box 1046
Ottawa, ON
K1P 5S9

AeCb

Project Title / Titre du Projet**Category /
Catégorie**

G. Rzentkowski
Program Officer

Phone (613) 995-5894
FAX: (613) 992-2915

Groundwater Inflow Into Deep Underground Mines - Phase III**13**

The purpose of this project is to carry out the third phase of a three-phase study of the geological, hydrogeological, geochemical and geotechnical conditions at deep underground excavations located on the Canadian Shield. The study will be undertaken in the field and will examine conditions in deep underground mines with special emphasis on groundwater inflow into the mines with underground openings at depths in excess of 500 metres, irrespective of the rock types and the ore mined.

This study is proposed because groundwater flow is recognized as the dominant factor for radionuclide release and transport from a repository to the biosphere. Due to limitations of site investigation methods, the assessment and prediction of the long-term hydrogeological conditions in a repository cannot be completed with a great degree of confidence. In order to increase the confidence in these assessments, it is believed that studies of deep underground mines could be used, because they can provide additional perspective and support for the conditions that could exist in a repository.

Atomic Energy Control Board
Research and Support Division
P.O. Box 1046
Ottawa, ON
K1P 5S9

Project Title / Titre du Projet	Category / Catégorie
Eric Rabin Research Program Officer	Phone (613) 995-5894 FAX: (613) 992-2915
Physical Characteristics and Solubility of Long-Lived Airborne Particulates in Uranium Producing and Manufacturing Facilities	13
<p>The purpose of this project is to determine, experimentally, the size distribution, the activity distribution and the solubility of airborne uranium-bearing aerosols in all Canadian uranium mines and mills, refineries, conversion facilities and fuel fabrication plants.</p>	
<p>It is anticipated that this study will provide information necessary for the determination of the ALI for long-lived dust and for the interpretation of bioassay data obtained from the workers at these facilities.</p>	
Analysis of Saskatchewan Uranium Mines Environmental Data	13
<p>The purpose of this project is to create the infrastructure necessary to analyze environmental data generated by Saskatchewan uranium mining facilities. This includes acquisition of computer hardware and generation of software that will enable AECSB staff to perform compliance and statistical analyses of submitted environmental data in an efficient and timely manner.</p>	
<p>It is expected that at the completion of this project, AECSB staff will have the necessary computer tools to enable efficient and comprehensive review of environmental data generated by uranium mining facilities.</p>	

Atomic Energy Control Board
Research and Support Division
P.O. Box 1046
Ottawa, ON
K1P 5S9

Project Title / Titre du Projet	Category / Catégorie
Analysis of Uranium Mine Workers Exposure Data	13
<p>The purpose of this project is to provide AECB staff with the necessary tools to analyze uranium mine workers' exposure data. A standard computerized readable format to be used by uranium mining companies to report occupational exposure will be defined, and the required software for the storage and analysis of these reports will be developed. At the completion of this project, AECB staff will have the necessary tools to assess, without delay, uranium mining companies' compliance with the regulatory doses and exposure limits, and with other pertinent licensing conditions.</p>	
Lung Cancer Among Uranium Miners in Germany	13
<p>The purpose of this project is to conduct an epidemiological study of lung cancer among uranium miners in Germany and to evaluate the risk of lung cancer per unit exposure to radon progeny, taking confounding factors present in the work place into account.</p>	
<p>It is anticipated that the results of this study will improve the accuracy of the risk estimates for lung cancer owing to exposure to radon progeny, and will improve our understanding of the influence of various confounding factors on these risk estimates. (This is a joint study with the Institute for Radiation Hygiene (GSF) of the Federal Health Office, Neuherberg, Germany. The major contribution of \$1.5 million will come from the GSF. The AECB will contribute technical expertise, costing about \$25K per year, during the anticipated six-year period of this study.</p>	

Atomic Energy Control Board
Research and Support Division
P.O. Box 1046
Ottawa, ON
K1P 5S9

AeCb

Project Title / Titre du Projet	Category / Catégorie
A Case-Control Study of Beaverlodge Uranium Miners from 1950-1980	13
<p>The purpose of this project is to conduct a case-control study of lung cancer among Beaverlodge uranium miners. The mortality in a case-control group of 195 miners (65 cases and 130 controls) for the mortality period 1950-1980 will be analyzed. The individual revised exposure estimates of the 195 miners, obtained in an earlier AECSB-funded study (4.118.3), will be used in this study to calculate revised risk estimates for lung cancer due to radon progeny. Additionally, an estimate of the measurement errors on exposure estimates will be obtained in this analysis.</p> <p>It is anticipated that the results of this study will provide more reliable estimates for lung cancer due to radon progeny exposures. Additionally, quantitative estimates of the measurement errors obtained from this study will be used in a future (4.118.5) cohort analysis to determine risk estimates for the entire cohort.</p>	
Study of the Health Effects of Inhaled Uranium Ore Dust - Phase 3	13
<p>The purpose of this project is to continue with the third phase of the ongoing project to study the health effects (induction of cancer of the lung, cellular defects) on experimental animals exposed to different concentrations of airborne high grade uranium ore dust. Inter-organ transfer of uranium and the rate of clearance from the lung will also be studied.</p> <p>In addition to the partial information already obtained, it is anticipated that this study will indicate whether inhaled high grade uranium ore dust induces lung cancer in rats whose response to radon daughters is already known. An attempt will be made to quantify the dose-response relationship. Short-and long-term metabolism of uranium will also be studied and the data will be used to refine current internal dosimetric models.</p>	

Atomic Energy Control Board
Research and Support Division
P.O. Box 1046
Ottawa, ON
K1P 5S9

AeCb

Project Title / Titre du Projet**Category /
Catégorie**

Dietary Survey of Hatchet Lake Band**13**

It is proposed that a detailed dietary survey be conducted of the Hatchet Lake Band, which is located in the uranium mining region of Northern Saskatchewan. This project will provide current, site-specific dietary data for use in assessments of dose to the Hatchet Lake Band resulting from exposure to radionuclides released to the environment by local and regional uranium mining activities. The survey will also address the consumption and external use of local biological products for medicinal and possibly other cultural purposes, since such products could contain radionuclides and thus lead to radiation exposure.

The results of the study will be used by the AECSB: (i) to verify that the predicted doses to the Hatchet Lake Band, that are presented in current EIS, are not less than doses estimated using the dietary data obtained in this study; (ii) as dietary data for use in preparing or reviewing future radiation dose assessments of Northern Saskatchewan native communities.

B.C. Geological Survey Branch
1810 Blanshard Street
5th Floor
Victoria, BC
V8V 1X4

BCGe

Project Title / Titre du Projet**Category /
Catégorie**

Allan Wilcox
Assessment Report Geologist

Phone (250) 952-0390
FAX: (250) 952-0381

Assessment Report Indexing System (ARIS)**9**

Results of mineral exploration programs are described in assessment reports, which are submitted by the industry to the Ministry in compliance with the Mineral Tenure Act. ARIS is a relational database that is an index and administrative tracking system to the Geological Survey Branch's Mineral Assessment Report Library of more than 24,000 reports, dating from 1947. About 600 new reports are added annually. The assessment reports are used as a primary source of information for MINFILE.

B.C. Trade & Investment Office
730-999 Canada Place
Vancouver, BC
V6C 3E1

Project Title / Titre du Projet**Category /
Catégorie**

**Donald F. Gunning, P.
Eng.**
Natural Resources Branch Contractor

Phone (604) 844-1912

FAX: (604) 660-2457

Promotion and Development of B.C. Dimension Stone and Refractory Minerals

6

Market studies, promotion and facilitation of B.C. dimension stone, primarily granite and refractory minerals both domestically and in export markets around the Pacific Rim.

Barrick Gold Corporation
Holt McDermott Mine
P.O. Box 278
Kirkland Lake, ON
P2N 3H7

Project Title / Titre du Projet	Category / Catégorie
Peter L. Barber Ventilation/Rock Mechanic Technologist	Phone (705) 567-9251 FAX: (705) 567-6867
Miroc Microseismic Monitoring	11
A study on microseismic activity at the Holt McDermott Minesite using a high frequency microseismic monitor, manufactured by ESG Canada.	
Information gathered at Holt McDermott by mine staff is being used to create a database to better understand ground movements during the mining process. Stephen Butt, of Queen's University is studying the information.	
Miroc Mineguard Spray-On-Liner	6
A study conducted at the Holt McDermott Minesite to study the effects of the Miroc Mineguard Spray-On-Liner on reducing resistance to airflows in underground air ways.	
The study was conducted by Euler De Souza of Queen's University.	
In Situ Stress Measurements	11
A study performed by Golder Associates on the 650 meter level of the Holt McDermott Minesite to determine magnitude and orientation of the in situ stresses near the South Mining Zone.	
The information obtained will be used for future mine planning and stope sequences.	

Barrick Gold Corporation
Holt McDermott Mine
P.O. Box 278
Kirkland Lake, ON
P2N 3H7

Project Title / Titre du Projet**Category /
Catégorie**

Tony Robles
Environmental Co-ordinator

Phone (705) 567-9251
FAX: (705) 567-6867

**Enhancing Natural Degradation Gold Mill Effluent using pH
Adjustment and Conversion of Effluent to Snow**

2,3

The pH of mill effluent (pH > 11) will be lowered to about 8.5 by carbon dioxide injected into the pipe carrying the effluent to the tailings basin. This process will increase volatilization of hydrogen cyanide and hydrolysis of cyanate to ammonia. The second project is the volatilization of ammonia in the effluent by converting the effluent to snow during the winter months.

Billiton Metals Canada Inc.
Les Mines Selbaie
P.O. Box 370
Joutel, QC
J0Y 1N0

Project Title / Titre du Projet**Category /
Catégorie**

Darrell Nichols
Manager, Business Development

Phone (819) 756-2491
FAX: (819) 756-2684

Silver Recovery from Zinc Rich Ores**7**

Payable levels of silver content in zinc concentrate is still too poor. Billiton Metals Canada Inc. is attempting to develop a method to recover silver at a payable level.

Cambior inc.
Mine Bouchard-Hébert
596 Rang des Ponts
Clérick, QC
J0Z 1P0

Project Title / Titre du Projet**Category /
Catégorie**

Marc Ruel
Géologue en chef

Phone (819) 637-2075
FAX: (819) 637-2194

Usine de flottation

7

La Mine Bouchard-Hébert située à 30 km au Nord-est de Rouyn-Noranda est un gisement polymétallique avec des réserves de 10 452 000 tm à 4,31% Zn, 0,83% Cu, 40,4 g/t Ag et 1,3 g/t Au. Une usine de flottation sur le site, transformera la production pour environ 13 ans à un rythme annuel d'un peu plus de 800 000 tm. Pour accomplir l'ensemble du travail, l'équipe de la mine est composée de 122 personnes.

Cambior inc.
Mine Chimo
C.P. 9999 - 1075, 3e avenue, est
Val d'Or, QC
J9P 6M1

Project Title / Titre du Projet		Category / Catégorie
<hr/>		
Chantale Doucet Ingénieure de projet	Phone (819) 736-4561 FAX: (819) 736-7111	
Collecte et analyse des événements sismiques à la mine Chimo		11
L'installation d'un système sismique par CANMET et l'analyse des événements dans le but de découvrir les phénomènes qui causent les coups de toit.		
"Quantitative Evaluation of Pastefill Performance to Alleviate Rockburst at Chimo Mine"		11
Étude sur le comportement du remblai en pâte effectuée par l'université McGill dans le cadre de l'entente auxiliaire Canada/Québec sur le développement minéral (EADM).		
Marc Guimont Technologue	Phone (819) 825-0211 FAX: (819) 825-0342	
Restauration de sites minier		3,9
Décontamination - Démentèlement d'infrastructures, d'équipements, de terrassement et de revégétation des sites inactifs.		

Cape Breton Development Corp.
P.O. Box 2500
Prince Mine
Sydney, NS
B1P 6K9

Project Title / Titre du Projet**Category /
Catégorie**

Fred Howard
General Manager

Phone (902) 736-7491
FAX: (902) 736-7480

Haulage Extension**6**

One of two major transportation systems is being extended to a distance of over 20,000 feet from the mine entrance. This will increase work time availability at the face and enhance material transportation.

Booster Ventilation Fan**6,13**

A major booster ventilation fan was constructed in 1995 underground in series with the main surface fan on the shoreline. This will increase the effective air at the workings when commissioned.

Waste Water Treatment Plant**3**

Completed in early 1995. Treats mine water discharge and surface drainage at 1600 USGPM by conventional lime neutralization process. A flocculent is added to the treated water as it is discharged to setting ponds, where precipitated metals settle out. Clean water is decanted off, and the solids are periodically removed and disposed of.

Centre de recherches minérales
2700, rue Einstein
Sainte-Foy, QC
G1P 3W8

CeRe

Project Title / Titre du Projet**Category /
Catégorie**

Jacques-André Boivin
Chercheur

Phone (418) 643-4505
FAX: (418) 643-6706

Développement d'un analyseur portatif d'or**12**

L'objectif principal de ce projet est le développement d'un prototype expérimental présentant une limite de détection inférieure à la teneur de rentabilité reconnue pour les gisements québécois (3-4 g/t). La limite de détection cible est de 1 g/t (1 ppm). Les résultats de l'étude invitent à la poursuite des travaux selon le barème suivant: 1- Réaliser un prototype basé sur la technologie de spectroscopie par claquage laser (SCL) pour des essais éventuels dans une mine; 2- Développer une stratégie d'échantillonnage compatible avec les besoins des utilisateurs; 3- Évaluer l'approche dite des "éléments associés" appliquée avec un certain succès en Chine et établir son potentiel réel pour l'application désirée; 4- Amorcer les démarches avec des partenaires industriels en vue d'un transfert technologique éventuel et le développement d'un produit commercial.

Dux Machinery Corporation
615, rue Lavoisier
Repentigny, QC
J6A 7N2

Project Title / Titre du Projet**Category /
Catégorie**

Hermann K. Bum Mueller
President

Phone (514) 581-8341
FAX: (514) 581-5138

Multi-purpose Cassette Porter (Prime Mover) Mine Transport System 5,12

Remote Controlled Lift Platforms 5,12

**High Speed u/g Articulated Teledump and End Dump Trucks with
Detroit Diesel DDEC Electronically Controlled Engine** 5,12

**New Type of Backfill Haul Truck with Leakproof Hydraulically
Controlled Tailgate** 5,12

**Rail Bound Electric/Hydraulic Powered 1/2 cu.yd. Capacity Decline
Mucking Machine** 5,12

Electron Service Monitoring Systems 5,12

Echo Bay Mines Ltd.
Lupin Mine
Lupin, NW
X0E 1M0

EcBa

Project Title / Titre du Projet**Category /
Catégorie**

Moe Sandhu
Senior Mine Planner

Phone (403) 890-8778
FAX: (403) 890-8766

**Development of Design Guidelines for Narrow Vein Mining in Terms
of Minimizing Dilution**

4,10

The objective of the project, being carried out in co-operation with CANMET, is to develop design guidelines for narrow vein open stope operations in order to reduce dilution and thereby increase overall recovered grade. Specific tasks are to develop a geotechnical database, characterize the mining method, evaluate cable support and drill/blast procedures, cms monitoring and develop design guidelines.

École Polytechnique
C.P. 6079, Scc. Centre-Ville
Montréal, QC
H3C 3A7

ÉcPo

Project Title / Titre du Projet	Category / Catégorie
Michel Aubertin Professeur, chef de la Section de Génie des Mines	Phone (514) 340-4046 FAX: (514) 340-4477
Continuous Damage Mechanics for Rocks and Rock Masses	11,10
Development and application of continuous damage mechanics to describe the behaviour of soft and hard rocks with brittle and semi-brittle characteristics.	
Viscoplastic Modelling of Rock Salt	3,11
Development and application of viscoplastic model for the behaviour of rock salt. The model is a unified model with internal state variable that can describe a variety of loading conditions.	
Cover Technology for the Reclamation of Acidic Tailings Pond	3,4
Laboratory and field studies on the design of multilayered cover systems to control the production of acid mine drainage. Includes unsaturated flow modeling, oxygen transport measurements, construction techniques.	
Effect of Destressing on Rockburst Potential in a Hard Rock Mine	11,10
Laboratory and field investigation of the effect of distress blasting on rock mass properties in relation to bursting liabilities in a mine near Val d'Or, Québec.	

École Polytechnique
C.P. 6079, Scc. Centre-Ville
Montréal, QC
H3C 3A7

ÉcPo

Project Title / Titre du Projet	Category / Catégorie
Evaluation of Rockburst Potential in Hard Rock Mines	11,10
Application of a methodology for evaluation before excavations are created whether or not there is a potential for rockbursting using standard engineering tools, such as geomechanical classification laboratory rocks properties and numerical modeling.	
Étude du potentiel de coups de terrain à la mine Sigma en relation avec les effets du dynamitage de préfracturation	13
Ce projet de recherche vise à appliquer une méthodologie développée antérieurement par l'École polytechnique de façon à étudier l'effet du dynamitage de préfracturation sur le potentiel de coups de terrain à la mine Sigma. La méthodologie repose sur l'utilisation d'outils communs en mécanique des roches, tel les classifications géomécaniques, les propriétés de la roche intacte et les analyses de contraintes. En appliquant cette méthodologie, on étudie divers scénarios de dynamitage de préfracturation et on évalue les facteurs d'influence afin de dégager une approche rationnelle de conception.	

École Polytechnique
Département de génie minéral
C.P. 6079, succ. Centre ville
Montréal, QC
H3C 3A7

ÉcPo

Project Title / Titre du Projet**Category /
Catégorie**

Jorgen Elbrond
Professeur

Phone (514) 340-4923
FAX: (514) 340-4477

The Final Contours of Underground Mines**12**

The network flow algorithm developed for open pit optimal contours is examined to find the optimal contours of underground mines. Reconciliation of cut off grade optimization and optimal contours.

Burial of Industrial Plants**3**

Several mining methods are examined for their use in the decommissioning by burial of industrial plants, which might be toxic or even radioactive.

The True Value of Mine in a Developing Country**2**

Using the concept of mineral rent, the gain/loss of the various partners of mining projects particularly in developing countries are evaluated.

Elliot Lake Research Station/ MNDM
75 Dieppe Ave.
Elliot Lake, ON
P5A 2R8

MnDm

Project Title / Titre du Projet**Category /
Catégorie**

Debbie Berthelot
Facility Manager

Phone (705) 461-8375
FAX: (705) 461-8550

**Application of Geographic Information Systems (GIS) to Visualization
and Interpretation of Mining Effluent Impacts on a Regional
Watershed**

3

Using the Serpent River watershed near Elliot Lake as an example, the scope of this project was to assemble a watershed database of sufficient size to demonstrate the usefulness of GIS technologies to the visualization and interpretation of mining effluent environmental impacts, and to generate an interactive tool simple enough to allow interaction with the general public and non-GIS specialists. The project is delivered through the Elliot Lake Research Field Station of Laurentian University in collaboration with CANMET, Rio Algom Limited and Denison Mines Limited. Partial funding is provided through the Northern Ontario Development Agreement (NODA).

Falconbridge Ltd.
Kidd Creek Division
P.O. Bag 2002
Timmins, ON
P4N 7K1

Project Title / Titre du Projet	Category / Catégorie
David Counter Senior Projects Engineer	Phone (705) 267-8644 FAX: (705) 267-8709
Blast Damage Assessment - Kidd Creek No. 3 Mine	10,11
Camera surveys, blast monitoring, cavity monitoring, and fragmentation analysis have been used to assess blast damage and rock mass response around a test stope at a depth of 1450 m at the Kidd Creek No. 3 mine to allow better planning for mining deep ore (>2km).	
Stan Kaczmarer Chief Mine Engineer	Phone (705) 267-8655 FAX: (705) 267-8702
Ore Pass Lining Projects	11
The objective of this project is to assess the value of several differing support lining systems, that may enhance the long-term stability of an ore pass at depth. Combination of normal and high strength shotcretes in combination with cablebolts provide the ground support. A monitoring program will measure the stability and effectiveness of the design over time.	

Falconbridge Ltd.
Sudbury Operations
Onaping, ON
P0M 2R0

FaLt

Project Title / Titre du Projet**Category /
Catégorie**

H.A. Smith
Chief Engineer, R&D Projects

Phone (705) 966-3411
FAX: (705) 966-6500

Development of an Expert System Scheduling Module**7**

This joint Falconbridge - CANMET effort involving the development and test of a simulation scheduling program in the form of an expert system. The program is designed for use in a situation in which a given crew and set of equipment has responsibility for multiple working faces. Significant benefit potential is seen in the ability to rapidly run a series of "what-if" scenarios in which face priority, type of equipment, manpower, etc., etc., are varied. The program is currently under testing at Falconbridge.

Fluor Daniel Wright
1075 West Georgia Street
Vancouver, BC
V6E 4M7

FIDa

Project Title / Titre du Projet**Category /
Catégorie**

Brian Montpellier
Project Manager

Phone (604) 691-9371
FAX: (604) 687-6130

Cerro Verde Project**4,8**

Conversion of the Cerro Verde Mine in Peru to leach chalcocite on a permanent pad. Expansion of fine copper production to 105 MM pounds/year.

Fording Coal Limited
P.O. Box 5000
Elkford, BC
V0B 1H0

FoCo

Project Title / Titre du Projet**Category /
Catégorie**

Robin Sheremeta
Mining Engineer

Phone (604) 865-3209
FAX: (604) 865-3353

GPS Applications in Mining**3**

Global positioning system survey technology presently being developed includes 1) Survey and 2) Shovel grade control. Survey technology is being developed/utilized in conjunction with Ashtech to improve existing survey systems. Shovel grade control is being developed to provide elevation data to the operator and allow engineered grade designs to be input into the system for feedback to the operator relative to the design.

GPS Survey and GPS truck dispatch system is presently in use at Greenhills.

Fording Coal Limited
Fording River Operations
P.O. Box 100
Elkford, BC
V0B 1H0

Project Title / Titre du Projet	Category / Catégorie
Robin D. Gas Mining Engineer, Long Range Planning	Phone (604) 865-5615 FAX: (604) 865-5699
Drill Monitoring - Open Pit	12
Measure drilling parameters and machine response in order to provide strata recognition.	
Drill GPS - Open Pit	12
Use GPS (Global Positioning Satellites) to guide production drills onto the design location of drill holes. This eliminates the need for surveyors to stake drill holes.	
Shovel GPS - Open Pit	12
Use of Global Positioning Satellites to provide shovel grade information to operators and eliminates the need for surveyor grade control.	
GPS Survey	12
Use of Global Positioning Technology for surveying in an open Pit Mine.	

Geological Survey of Canada
Institute of Sedimentary & Petroleum Geology
3303 - 33rd Street, N.W.
Calgary, AB
T2L 2A7

GeSu

Project Title / Titre du Projet**Category /
Catégorie**

Michael Dawson
Project Leader, Scientific Authority

Phone (403) 292-7115
FAX: (403) 292-7159

Coalbed Methane Research Canada**2**

A multi-year project to assess the coalbed methane potential of coal deposits in Canada. The project is focused in two main directions: (a) assessment of the resources potential of coal bearing regions of Canada, and (b) to examine and understand the relationship between coal compositional characteristics and key criteria for coalbed methane generation, storage and production.

F. Goodarzi
Geological Research Scientist

Phone (403) 292-7116
FAX: (403) 292-7159

**Dispersion of Trace and Other Elements into the Environment as a
Result of Coal Combustion****3**

A long-term investigation of the abundance and distribution of elements of prime environmental concern (As, Cd, Cr, Hg, Mo, Pb, Se, Th, U) in in situ coal, milled coal, power plant ashes, and emitted material in Canada (Participants: TransAlta Utilities Corp., Edmonton Power Ltd., Alberta Power Ltd., Nova Scotia Power Corp., Alberta Energy, Alberta Research Council, CANMET (CCRL and WRC), Environment Canada).

Geological Survey of Canada
Institute of Sedimentary & Petroleum Geology
3303 - 33rd Street N.W.
Calgary, AB
T2L 2A7

Project Title / Titre du Projet

Category / Catégorie

J. David Hughes
Head, Coal Sub-Division

Phone (403) 292-7117
FAX: (403) 292-7159

Technology Development for Geological Modelling, Resource Analysis and Remote Sensing (National Coal Inventory)

4

Development and maintenance of sophisticated geological and resource analysis capabilities for surface and underground mineable?? coal resources, coalbed methane and other stratified deposits (groundwater, oil and gas). Provides data interface for National Coal Inventory to third party GIS, CAD and image processing systems to provide internal and external clients customized, digitally processable products. Technology transfer through sale of software licenses to external clients (participants: PerArdua Ltd., Hithner Exploration Services Ltd., Grasswood Geoscience Ltd., University of Calgary, Terralogic Ltd.).

Computer-based Inventory of Economics, Quality, Contaminants and Land use Issues of Canada's Coal Resources (National Coal Inventory)

4

Development of a comprehensive inventory of geological, coal quality and other information relating to the competitiveness and environmental issues of Canada's coal resources. Geological models of deposits allow cost functions and quality to be evaluated for various mining scenarios and the value of resources to be assessed relative to alternative land use. Outputs are provided to internal and industry clients in a digital Geographic Information System format. Participants: Alberta Power Ltd., Luscar Ltd., Nova Scotia Department of Natural Resources, Nova Gas Transmission Ltd., Trans Canada Pipelines Ltd., Saskatchewan Energy and Mines, Saskatchewan Power Corp.

Golder Associates Ltd.
432 Westmount Ave., Unit H
Sudbury, ON
P3A 5Z8

GoAs

Project Title / Titre du Projet	Category / Catégorie
--	---------------------------------

David Landriault
Senior Mining Engineer

Phone (705) 524-8861
FAX: (705) 524-1984

Mine Paste Backfill Design

8

Laboratory assessment of tailings for use as a paste backfill. Determination of cement content for required strength of cured backfill.

Hemlo Gold Mines Inc.
Golden Giant Mine
P.O. Box 40
Marathon, ON
P0T 2C0

Project Title / Titre du Projet	Category / Catégorie
Brian Anderson Engineering Superintendent	Phone (807) 238-2101 FAX: (807) 238-1013
Cavity Monitoring System	7,8
Use of a laser survey device to measure mining extraction on a stope by stope basis. This information is used to determine dilution and recovery.	
Geoff Newton Mine Planner	Phone (807) 238-1121 FAX: (807) 238-1013
Development under Backfill	6
Design standards and procedures for developing under backfill. This technique is necessary to recover sill pillars.	
Jim Paynter Senior Project Engineer	Phone (807) 238-1121 FAX: (807) 238-1013
Block to Mine Development	6
Design and develop a mining system for the block 5 ore zone. This zone is narrow and will be accessed from existing underground openings.	
Pastefill System	8
Design and construct a pastefill system for the Golden Giant Mine.	

Hemlo Gold Mines Inc.
Golden Giant Mine
P.O. Box 40
Marathon, ON
P0T 2C0

HeGo

Project Title / Titre du Projet**Category /
Catégorie**

Mike Toppi
Mine Planner

Phone (807) 238-1121
FAX: (807) 238-1013

Bulk Emulsion Explosive

7

Facilitate the change from ANFO Explosives to water resistant bulk emulsion explosives.

Highland Valley Copper
P.O. Box 1500
Logan Lake, BC
V0K 1W0

Project Title / Titre du Projet**Category /
Catégorie**

Mark Richards
Senior Mine Engineer

Phone (604) 575-3379
FAX: (604) 575-3302

Global Positioning System (GPS) for Shovels**3,5**

It is planned to install GPS receives and associated hardware to provide the shovel operator with an indication of his elevation and a moving map display to show dig limits, ore/waste boundaries, etc. The outputs are updated in real time.

Global Positioning Systems for Drills**3,5**

It is planned to integrate a GPS based navigation system with the existing drill sensors on the mine's Bucyrus 49R drills. The operator's cab will be equipped with a moving map display, allowing the operator to navigate to a blasthole without the need for physical marks in the field.

Geographic Information Systems (GIS)**3,1**

The implementation of a geographic information system. This is a graphical method of representing data that allows the user to identify spatial relationships between map features. Benefits will include: improved data integrity, streamlined, map making, use data as an information tool to support management decisions.

Deep Dewatering/Piezometer Holes for Slope Stability**10,11**

To test for deep groundwater in pit wall rock (a phase of the Guichon Batholith). Testing will be conducted to assess and enhance the permeability of the rock mass at depth. Tests will involve falling head tests, water injection and pump tests. This is a well developed toppling zone.

Hudson Bay Mining and Smelting Co. Ltd.
P.O. Box 1500
Flin Flon, MB
R8A 1N9

Project Title / Titre du Projet**Category /
Catégorie**

Ernie Yuskiw
Project Manager

Phone (204) 687-2067
FAX: (204) 687-6954

Trout Lake Mine Deepening Project**6**

This project involves sinking a 4.9 diameter shaft 425 metres directly below a 10 meter rock pentics at the bottom of the existing 675 meter operating shaft. In addition all accessory ore handling facilities and mine infrastructure to produce at a rate of 1,000,000 tons of ore per year. The handling facilities include grizzly, rock breaker, conveyor, and ore bins mine, infrastructure includes power upgrade ventilation system upgrade and decline access to 1200 meters below surface. The project is 55% complete as at April 30, 1996. Completion is anticipated July, 1997.

Hudson Bay Mining and Smelting Co. Ltd.
Photo Lake Mine
General Delivery
Snow Lake, MB
R0B 1M0

Project Title / Titre du Projet	Category / Catégorie
Jim Mihalicz Mine Foreman	Phone (204) 358-5220 FAX: (204) 358-2115
Development of Team Concept	1
<p>"Breakthrough philosophy" within our company encourages team work. How is Photo Lake Mine implementing and encouraging the team concept?</p>	
Clair Pilgrim Mine Planners	Phone (204) 358-2115 FAX: (204) 358-5200
Opti-Trak Truck Haulage	12
<p>The Opti-Trak system is a computerized guidance system for underground haulage vehicles to operate fully automatically without an on board operator. At Photo Lake Mine, the trucks will travel from 140 m level to a surface dump location into a crusher hopper. Remote controlled ore chutes from the crusher building is an option to be installed.</p>	
Mike Yao Rock Mech. Eng.	Phone (204) 687-2006 FAX: (204) 358-2115
Resin Anchor - 6 feet of Cable Bolts - Wet Holes	11
<p>Cable Bolt holes are 2 1/2" in diameter, 50' vertical, and wet. Water varies from drip to a small steady stream. Test resin anchor - installation procedures for 10' and 50' double cable bolts in wet vertical holes.</p>	

INCO Ltd.
38 Godfrey Drive
Copper Cliff, ON
P0M 1N0

INL

Project Title / Titre du Projet**Category /
Catégorie**

Eric H. Hinson
Supervisor Mining Automation Program

Phone (705) 682-5302
FAX: (705) 682-6601

Mining Automation Program (MAP)**12**

MAP is a 5-year program that started in January 1996. It is looking at the complete operation of an underground ore body using tele-operation, autonomous, and semi-autonomous technologies. The results will be a new mining method choice for operators.

INCO Ltd.
Mines Research
38 Godfrey Drive
Copper Cliff, ON
POM 1N0

Project Title / Titre du Projet	Category / Catégorie
Allan D. Akerman Supervisor Automation & Robotics	Phone (705) 682-5293 FAX: (705) 682-6601
Underground Haulage Truck Automation	5
Combine LHD activities with truck haulage to develop a closed system of ore handling between the draw point and the ore pass/crusher.	
Simulation Studies	9
Simulation of mining processes to determine present and future mine capability.	
Road Router	5
To produce a machine capable of creating a satisfactory roadbed to a uniform height and grade. Improve throughput and performance of current machine.	
Pen Computer Data Collection for Ramp Tests	9
To develop a computer based method of collecting and storing sufficient data generated during mandated ramp test procedures.	
Guided Drill System	5
Development of a guided drill system for hardrock blast holes' using internal guidance controls to follow a predetermined path.	

INCO Ltd.
Mines Research
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Copper Cliff, ON
P0M 1N0

INLt

Project Title / Titre du Projet	Category / Catégorie
Maintenance Communication	9
On line monitoring of vehicle health, with reporting to the operator and maintenance system. Automation of service check intervals and performance characteristics of individual equipment.	
Infrastructure Development	1
Develop systems to minimize infrastructure requirements and deployment in a mine. Entails enhancements to Inco's broadband communication architecture.	
Intelligent Vision Sensor	2,12
Development of a vision-based sensor system to automatically detect flaws and wear in hoist ropes.	
Scrap Removal from Ore Flow	6,7
1) Teleoperation of manipulators to remove scrap material from picking belts located down stream of a crusher. 2) Scrap detection and removal to be automated.	

INCO Ltd.
Mines Research
38 Godfrey Drive
Copper Cliff, ON
POM 1N0

Project Title / Titre du Projet	Category / Catégorie
Samantha Espley Mines Research Engineer II	Phone (705) 682-5809 FAX: (705) 682-6842
Rockburst Simulation Modelling (MAP3D)	11
Kinetic energy calculations and loading stiffness will be incorporated with the MAP3D software. The model will be calibrated with actual case studies from Inco's Creighton Mine. The new code will allow for decisions regarding mining sequences and support requirements based on estimated energy release values and associated magnitudes.	
Ground Support Design	11
Project aimed at developing designs, procedures, and applications of support which are best suited to various mining conditions/environments.	
Optimization of Cable Bolt Reinforcement for Underground	11
Collaborative Research and Development (CDA) with American Barrick, Hudson Bay Mining and Smelting, Inco, and Miroc (Camiro) for the creation of a fully computerized design model for the optimization of modified cable bolt applications in mining - software entitled "Cable". Directed by Prof. Wil Banden, Queen's University.	
Post Pillar and Abutment Monitoring	11
Project to assess the performance of post pillars and excavation quality via observational indices and instrumentation at the McCreedy E. main zone. Within the scope, the project will assess/measure the in situ stresses at the 3830 level.	

INCO Ltd.
Mines Research
38 Godfrey Drive
Copper Cliff, ON
P0M 1N0

INLt

Project Title / Titre du Projet	Category / Catégorie
Mineguard Implementation	11
Project is aimed at defining the procedures and application limitations for using Mineguard (polyurethane spray-on liner) as a ground support product in the underground workings. Within the project, training, equipment development, isocyanate testing/requirements for personal safety, and further research of support potential will be explored.	
John Galbraith Mines Research Engineer	Phone (705) 682-5348 FAX: (705) 682-6842
Ore Pass Enlargement Study	6
Study of the initiation and development of ore pass enlargement problems and of the performance of ground support in passes. Development of laser and video profiling equipment to monitor pass wear.	
Ore Pass Hang-up Removal	7
Development of a system to blast blockages at a height of 30 to 300 feet above the access point.	
Robert Gustas Research Engineer	Phone (705) 682-5813 FAX: (705) 682-6842
Boltless Shotcrete Trial	11
Determine the effectiveness of a steel fibre reinforced shotcrete in a sublevel cave mining area (subjected to both development and production blasts).	

INCO Ltd.
Mines Research
38 Godfrey Drive
Copper Cliff, ON
POM 1N0

Project Title / Titre du Projet**Category /
Catégorie**

Backfill Plug Design**11**

Examine existing theoretical considerations and how they relate back to practical implications.

Mike Leblanc
Technical Specialist

Phone (705) 682-5807
FAX: (705) 682-6842

Slotted Perimeter Technology**6**

To define the optimum drilling and timing pattern of development drifting utilizing a slotted perimeter. The attenuation influence of the slotted perimeter will be studied to determine if a webbed pattern or closely spaced conventional holes can simulate the effect of the open slot generating the same damage control.

Wayne Lidkea
Research Engineer

Phone (705) 682-5814
FAX: (705) 682-6842

Blasting Overpressure, Prediction and Control**11**

Define and modify existing theories for predicting the overpressure and air shock waves generated from the detonation of explosives in underground workings. The theories will be incorporated into modeling and simulation programs used for design and planning of electrical instrumentation and development headings. The program will focus on the safe coexistence of blasting and electrical control systems in advanced underground mines of the future.

INCO Ltd.
Mines Research
38 Godfrey Drive
Copper Cliff, ON
P0M 1N0

Project Title / Titre du Projet**Category /
Catégorie**

Terry Villeneuve
Project Manager

Phone (705) 682-5804
FAX: (705) 682-6842

Spatial and Temporal Seismic Analysis, Phase 2

11

Two projects have been ongoing since 1992 with the original intent to optimize the information of ISO-MP Data. This project is to evaluate the association between patterns in induced microseismic activity and the occurrence of larger seismic events. (Dr. Mariana Eneva, University of Toronto, Principal Researcher).

Self-Organized Critical Seismicity Model

11

Develop a customized self-organized critical cellular automated model with long-range deterministic coupling to simulate seismicity at Creighton Mine. (Dr. John McCloskey, University of Ulster, Principal and Dr. Chris Bean, University College Dublin, Researcher).

Whole Waveform Research

11

To determine the usefulness of the source parameters and combinations of source parameters that are now being routinely produced by the whole waveform system at Creighton Mine. (Pavel Vasar of NEMS at Creighton Mine).

Stochastic Analysis of Creighton Micro-Data

11

The objective of this project is to determine a methodology by which meaningful relationships between the available data set (variable) can be identified and extended to improve a method for improved rock mass characterization. To find the relationship between rockbursts and inducing factors (in mining, geology, stress, etc.). (R. Mercer, Ph., D. Candidate, Queen's University).

Industries de câbles d'acier Ltée
5501 Trans-Canadienne
Pointe-Claire, QC
H9R 1B7

Inde

Project Title / Titre du Projet**Category /
Catégorie**

Joseph Misrachi
Directeur amélioration des procédés

Phone (514) 428-8405
FAX: (514) 697-3884

Développement de câbles miniers hautes performances**5**

1) Développement de câbles "Dypac flattened strand" (pour augmenter la charge de rupture). 2) Développement de câbles de pelle plus performants.

INRS Géoressources
2700, rue Einstein
C.P. 7500
Sainte-Foy, QC
G1V 4C7

INRS

Project Title / Titre du Projet**Category /
Catégorie**

Michel Malo
Professeur

Phone (418) 654-2619
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**Guide pour la prédiction de la fracturation dans les carrières de
pierre de taille**

10

Mise au point d'un guide dont le cheminement permet à l'exploitant de carrières de pierres dimensionnelles de prédire la qualité des blocs de sa carrière ou d'évaluer le potentiel d'une propriété. La technique comprend des relevés de terrain, de la géostatistique et l'utilisation de certains logiciels. Le guide présente des notions de base sur l'échantillonnage des fractures, des conseils pratiques pour les relevés de terrain, l'acquisition et la gestion des informations recueillies. Les techniques de caractérisation et de représentation graphique de l'information qui sont proposées permettent de mettre en valeur les données ainsi recueillies. Enfin, une section est consacrée à la géostatistique. Toutes les techniques et méthodes sont illustrées par de nombreux exemples d'application dans les carrières et propriétés de granite au Québec.

Iron Ore Company of Canada
P.O. Box 1000
Labrador City, NF
A2V 2L8

IrOr

Project Title / Titre du Projet**Category /
Catégorie**

Rob Didur
Superintendent, Technical Services

Phone (709) 944-8542
FAX: (709) 944-8390

Luce Deposit Feasibility Study**2**

Assessment of a potential major iron ore deposit and its implications on the long range mine plan of IOC.

Mine Planning Systems Integration**12**

Integration of several discreet computerized engineering systems (QiPit, Lynx, Gemcom, Autocad) plus PC spreadsheets and database into an effective Mine Planning system to support both long-range and short-range mine planning.

Materials Handling Study**8**

Assessment of alternatives for material movement (ore + waste) in conjunction with development of a new strategic long-range mine plan. This study will address trolley assist, new loading pocket, large haul trucks and facilities.

Computerized Ore Blending System**12**

Investigations into the use of simulation and material flow modeling to predict blended ore grades from the ore pockets to the concentrator.

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IrOr

Project Title / Titre du Projet**Category /
Catégorie**

Ron Doucet
Superintendent, Maintenance
Engineering

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FAX: (709) 944-8390

Remote Vital Signo Monitoring of Mining Equipment**3**

Remote monitoring of vital equipment stoppages for electric trains, shovels haulage trucks, drills, loading pockets. All VSM's are transmitted to the central dispatch systems for immediate action and post analysis.

Neural Network Vibration Analysis**12,2**

Use of artificial neural networks to diagnose the health of rotating machinery, haulage truck engines, electric locomotive, through the classification of vibration signatures.

Barry Hillier
Engineer, Mine Maintenance

Phone (709) 944-8376
FAX: (709) 944-8390

Global Positioning System Application (G.P.S.)**3,7**

G.P.S. surveying, G.P.S. truck dispatching, G.P.S. shovel elevation control, G.P.S. shovel ore quality control.

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IrOr

Project Title / Titre du Projet**Category /
Catégorie**

Leslie MacHattie
Superintendent, Field Maintenance

Phone
FAX:

Shovel Monitor**6,7**

Develop a shovel monitor capable to assess diggability of blasted material, perform load weighting capturing faults and calculate a condition-based monitoring index (CBMI) based on the amount of work performed. The CBMI will be the basis for shovel maintenance scheduling.

Norm Smith
Coordinator, Blasting

Phone (709) 944-8423
FAX:

Drill Monitor**11**

Drill monitor to assess ground fragmentation and determine depth of broken ground above blast hole. The detection of broken ground along blast hole will allow the savings in explosives.

IRSST

505, boul de Maisonneuve Ouest

Montréal, QC

H3A 3C2

Project Title / Titre du Projet	Category / Catégorie
Jean Arteau, ing., Ph.D. Chercheur	Phone (514) 288-1551 FAX: (514) 288-9399
Protection contre les chutes de hauteur	13
Accès par cordage, câble de secours horizontaux, ancrage, équipements de protection, garde-corps, essais, témoin-expert.	
Patrick Sébastien Directeur de programme	Phone (514) 288-1551 FAX: (514) 288-0998
Développement d'un logiciel de formation sur les systèmes de boulonnage	11
Ce projet propose la réalisation d'une application multimédia informatique pour mieux informer les mineurs sur le soutènement. Il est proposé le développement d'un logiciel d'apprentissage en boulonnage qui, tout en intégrant de façon rigoureuse les principes et la méthodologie d'installation de différents types de boulons, possède une base pédagogique adaptée à la formation des mineurs. La plate-forme multimédia permettra d'atteindre les objectifs visés. Une mise à l'essai sur le terrain permettra de raffiner le produit en fonction de la réception qu'en feront les utilisateurs.	

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Project Title / Titre du Projet**Category /
Catégorie**

**Nouvelle technologie d'instrumentation des câbles d'ancrage
cimentés pour le contrôle de la sécurité dans les exploitations
minières****11**

L'objectif principal du projet porte sur la validation d'une technique améliorée permettant le suivi des variations des efforts exercés sur les câbles ainsi que la détection instantanée de tout événement potentiellement dangereux. Un guide d'utilisation du dispositif de mesure sera rédigé à l'échéance du projet et diffusé auprès des ingénieurs oeuvrant en contrôle de terrain. Ce nouveau dispositif permettra d'obtenir des données essentielles sur le comportement du boulonnage par câbles.

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Montréal, QC

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IRSS

Project Title / Titre du Projet**Category /
Catégorie**

Guide de design des barricades de mine pour le remblai

11

Lorsqu'une ouverture souterraine est remblayée, il faut mettre en place des murs (barricades) aux voies d'accès afin de retenir le remblai. Dans l'éventualité d'une rupture de ces ouvrages, les voies d'accès seraient submergées par le remblai et la vie des travailleurs éventuellement présents serait en danger. Le paramètre crucial à considérer dans le design d'une barricade est la pression qu'elle devra supporter. Toutefois, c'est celui qui est le plus difficile à prédire. Plusieurs facteurs vont influencer la valeur de cette poussée. Malgré l'expertise acquise par les opérateurs sur leurs remblais, des ruptures de barricades sont encore observées. La faiblesse des méthodes actuelles d'estimation de la poussée entraîne un risque pour les travailleurs. Les résultats d'un programme d'essais au laboratoire seront utilisés pour le design des essais qui seront réalisés en chantier. Les essais in situ permettront de mesurer les caractéristiques mécaniques réelles des remblais. L'historique complet du remblayage d'un chantier sera étudié à l'aide d'instruments de mesure et d'observations. Ces résultats seront analysés et des simulations numériques serviront à définir les critères de design des barricades et du monde de remblayage. L'ensemble de ces données et de ces analyse vont permettre de mieux décrire et de quantifier les facteurs contrôlant la pression qui se développe sur les barricades. Un guide de design pour les barricades en chantiers remblayés sera produit pour pallier aux carences des outils actuels. Ainsi, l'ingénieur sera à même d'assurer un suivi plus rigoureux des ouvrages dans le temps et de mieux apprécier la marge de sécurité dont il dispose.

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Montréal, QC

H3A 3C2

Project Title / Titre du Projet**Category /
Catégorie**

Stabilité des piliers de mines à l'aide du cylindre instrumenté de l'Université de Sherbrooke

11

Les chercheurs utilisant le "cylindre instrumenté", un outil conçu à l'Université de Sherbrooke, pour mesurer les variations de déformation en trois dimensions, dans le but d'ausculter les piliers de mine pour évaluer leur stabilité. Le cylindre est relié à un système d'acquisition de données équipé d'un signal d'alarme. Le prise et l'interprétation des données ne requiert donc aucune présence humaine et l'alarme est déclenchée dès qu'un seuil critique de déformation est décelé. Les chercheurs procèdent à l'analyse des données recueillies pendant six mois à l'aide du cylindre. L'adoption de cette nouvelle méthode fournira aux exploitations minières un outil de contrôle fiable, permanent et sans danger.

Soutènement des excavations minières souterraines

11

Le modèle créé sera un outil de conception utilisable dans l'industrie minière permettant l'élaboration de stratégie de soutènement où "l'intuition" ne sera plus au premier plan. La sécurité dans les milieux de travail souterrains sera ainsi améliorée.

Stabilité des piliers de mines à l'aide du cylindre instrumenté de l'Université de Sherbrooke

11

Les données recueillies ont permis d'améliorer les techniques de conception des excavations souterraines en toute sécurité. L'étape suivante de ce projet consiste à mettre au point un système expert qui assure à la fois l'interprétation des données recueillies par le CIUS et le diagnostic automatique de la stabilité des ouvrages souterrains. Ce système permettra ainsi de détecter les instabilités qui pourraient nuire à la sécurité des travailleurs et de déclencher des signaux d'alarmes. L'objectifs de ce projet est de fournir aux exploitants miniers comme complément au CIUS, un logiciel informatique éprouvé qui gère l'acquisition des données en temps réel, traite et analyse les données et pilote le fonctionnement d'un système d'alarme.

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505, boul. de Maisonneuve Ouest

Montréal, QC

H3A 3C2

IRSS

Project Title / Titre du Projet**Category /
Catégorie**

Évaluation de la marge de sécurité caractérisant certains piliers de surface des mines souterraines du Bouclier canadien

11

Les piliers de surface sont la couche de roche laissée au-dessus d'une excavation minière souterraine, qui doit être assez solide pour retenir le sol meuble et l'eau. Ce projet visait à valider une méthode d'analyse de la solidité de ces piliers, qui tient compte des données relatives aux conditions géomécaniques réelles, notamment le nombre, la dimension et l'orientation des cassures de la roche, les infiltrations de sol et les pressions hydrauliques. Les investigations nécessaires à la collecte de ces données ont été réalisées sur deux sites; les informations recueillies ont été traitées pour contribuer à la construction d'un modèle prédictif de la solidité des piliers de surface. Les résultats obtenus par cette étude sont généralement applicables à toute excavation souterraine de faible profondeur, y compris celles des travaux publics.

Étude du potentiel de coup de terrain dans les mines: Phase 2: validation de la méthodologie

11

Dans une première phase, les chercheurs ont développé une méthodologie simple qui permet de déterminer le potentiel de rupture soudaine et violente de la structure rocheuse (coup de terrain) à la périphérie d'une excavation minière. La méthode mise au point a été partiellement testée sur deux sites miniers, mais exigeait une validation sur une plus grande échelle. Dans la deuxième phase, on a appliqué la méthodologie à un site où l'on sait qu'il existe des problèmes de coup de terrain, appuyant l'évaluation du potentiel de coup de terrain de ce site à la fois sur des données géomécaniques obtenues grâce à des relevés sur le site, et à des relevés sur le site, et à une modélisation informatisée.

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Montréal, QC

H3A 3C2

IRSS**Project Title / Titre du Projet****Category /
Catégorie****Contrôle des risques de coups de terrain par tirs de relaxation****11**

On peut réduire le niveau de contrainte par des explosions limitées qui fragmentent le massif. Bien que prometteuse, la technique des tirs de relaxation est peu utilisée au Québec à cause du manque de données et de son caractère empirique. Le projet vise à corriger cette lacune par la réalisation d'un guide sur l'utilisation de cette technique. Les résultats attendus sont: un guide pratique sur l'utilisation de tirs de relaxation afin de contrôler les coups de terrain; un outil informatique pour aider l'ingénieur à la conception des tirs de relaxation; un séminaire d'un jour de transfert de technologie à McGill.

**Évaluation du potentiel de coups de terrain dans les mines Phase 3:
élaboration d'un guide technique d'application de la méthodologie****11**

Les coups de terrain ("rockbursts") sont des ruptures violentes et soudaines de la masse rocheuse autour des excavations, qui se traduisent par l'expulsion d'un volume de roche et d'un relâchement d'énergie sismique. Cela constitue un grave problème pour la sécurité des travailleurs miniers appelés à oeuvrer dans ce milieu. Comme ce problème n'était pas facilement prévisible, les auteurs ont développé une méthodologie qui permet d'évaluer de façon préventive le potentiel de coups de terrain. Il s'agit maintenant de compléter le travail de validation de cette méthodologie, et de rendre celle-ci accessible à l'aide d'un guide technique de mise en application. L'utilisation de cette méthodologie devrait mener à une diminution de la fréquence des coups de terrain dans les mines souterraines en roche dure et ainsi protéger la sécurité des travailleurs.

IRSST

505, boul. de Maisonneuve Ouest

Montréal, QC

H3A 3C2

IRSS**Project Title / Titre du Projet****Category /
Catégorie****Élaboration d'un modèle de prédiction des contraintes in situ dans le
nord-ouest Québécois****11**

La réalisation de mesures de contrainte en utilisant l'une des techniques les plus fiables et les plus précises qui existent ("doorstopper" modifié), devrait permettre d'obtenir un modèle de prévision qui représente la tendance centrale et la dispersion réelle des contraintes sans qu'elles ne soient biaisées par des phénomènes parasites (technique inadéquate, modèle de calcul incorrect, équipe de terrain inexpérimentée). Lorsque les mesures auront été réalisées dans un certain nombre de mines, le modèle sera utilisé par les exploitants miniers pour réaliser des analyses de stabilité où seront entrées des données plus fiable que ce qui est disponible actuellement. Ces analyses permettront de localiser les zones où le potentiel d'instabilité met la vie des mineurs en danger et où des études plus détaillées devront être menées.

Kinross Gold Corp.
Macassa Mine
P.O. Box 550
Kirkland Lake, ON
P2N 3J7

KiGo

Project Title / Titre du Projet**Category /
Catégorie**

Paul Antoniazzi
Project Manager

Phone (705) 567-5208
FAX: (705) 568-3136

High Density Paste Fill**7,11**

The Blending of mill tails, sand and Portland cement to produce a high density paste (82-85% solids) material is distributed underground to a depth of 6600 feet.

La mine Niobec
3400, chemin du Columbium
St-Honoré-de-Chicoutimi, QC
G0V 1L0

Project Title / Titre du Projet**Category /
Catégorie**

Rudy Biss
Surintendant de la recherche

Phone (418) 673-4694
FAX: (418) 673-3179

Récupération du niobium réfractaire à partir des rejets de flottation 6

Ce projet est à confirmer à l'usine pilote. La combinaison de la gravimétrie de la flottation, de la séparation magnétique et de la lixiviation a fourni des résultats prometteurs.

Production de la soude caustique à partir des poussière récupérées lors des fusions 6

La production du ferroniobium génère des poussières très alcalines. Ce projet vise à développer un procédé permettant la production de la soude caustique à partir de ces poussières.

Amélioration de la qualité de l'eau recirculée à partir du bassin de rejets 6

Le projet vise à améliorer la qualité d'eau recirculée par des technologies efficaces et économiquement rentables. Il est projeté d'essayer l'osmose et la précipitation sélective sur des flux contaminés.

Bonification du concentré de magnétite 6

Ce projet a été complété au niveau du laboratoire déjà. Il est à vérifier au niveau de l'usine pilote. Ce projet vise à bonifier le concentré de magnétite pour pouvoir être utilisée dans la production du ferroniobium.

La mine Niobec
3400, chemin du Columbiun
St-Honoré-de-Chicoutimi, QC
G0V 1L0

Project Title / Titre du Projet	Category / Catégorie
Récupération de l'apatite à partir des rejets du concentrateur	6
Le projet vise à développer un procédé de concentration par flottation capable de produire un concentré d'apatite de haute qualité, plus de 38% P ₂ O ₅ .	
Martin Fortin Technicien en forage et dynamitage	Phone (418) 673-4694 FAX: (418) 673-3179
Chargement d'explosifs en vrac	7
Avec des trous de 300' de hauteur, le chargement des trous humides étaient dispendieux et long. Aujourd'hui, nous utilisons des explosifs pompables en vrac qui nous ont permis de réduire le coût et le temps de chargement dans ces conditions. Travaux exécutés conjointement avec Canex et ICI, (décembre 1994 - décembre 1995).	
Eric Lapointe Ingénieur à la production	Phone (418) 673-4694 FAX: (418) 673-3179
Étude sur la capacité du treuil et du chevalement	4,6
Une étude a été réalisée pour évaluer les modifications nécessaires au treuil et au chevalement en vue de la prochaine expansion du puits. Ce projet a été réalisé conjointement avec le CRM et la firme conseil G.L. Tiley, février - mars 1996.	

La mine Niobec
3400, chemin du Columbium
St-Honoré-de-Chicoutimi, QC
G0V 1L0

Project Title / Titre du Projet**Category /
Catégorie**

Arpentage des chantiers au laser (CMS)**6,11**

Plusieurs chantiers ouverts depuis plusieurs années et non remblayés ont été arpentés au laser (CMS) pour déterminer les profils réels et le taux de dilution. Ce projet a été réalisé avec la participation de la mine Williams, détentrice d'un CMS (Cavity monitoring system), octobre 1995.

Ghislain Pomerleau
Mining Engineer

Phone (418) 673-4694
FAX: (418) 673-3179

Caractérisation et instrumentation du pilier horizontal**10,11**

Dans notre processus de récupération des piliers, des travaux de caractérisation et d'instrumentation d'un pilier horizontal sont en cours. Trois trous à l'intérieur du pilier seront forés et la carotte caractérisée. Des senseurs triaxiaux à corde vibrante seront installés à l'intérieur des forages. Ce projet a été réalisé conjointement avec CANMET, juin - octobre 1996.

Design de piliers en prévision de l'expansion de la mine**4,6**

Ce projet avait pour but de monter un modèle numérique pour simuler l'exploitation de la mine. Des recommandations ont été émises concernant l'épaisseur des piliers horizontaux et verticaux ainsi que sur la séquence d'exploitation. Ce projet a été réalisé par la firme de génie conseil Bharti, décembre 1994 - mai 1995.

La mine Niobec
3400, chemin du Columbium
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G0V 1L0

Project Title / Titre du Projet**Category /
Catégorie**

Steve Thivierge
Superintendent, Engineering and
Maintenance

Phone (418) 673-4694
FAX: (418) 673-3179

Étude de pré-faisabilité pour l'expansion vers les niveaux inférieurs**2**

Cette étude avait pour but de comparer cinq (5) différents scénarios d'expansion et d'en faire ressortir le meilleur. Ce projet a été réalisé par les employés de l'entreprise, novembre 1995 - mai 1996.

Denis Villeneuve
Géologue

Phone (418) 673-4694
FAX: (418) 673-3179

Levé sismique**10,11**

Un levé sismique a été effectué afin de déterminer la localisation et d'estimer l'intensité de l'activité sismique à la suite d'un dynamitage de production. Avant le dynamitage, aucune activité sismique significative n'a été enregistrée. Le tir n'a pas modifié la fréquence et l'intensité de cette activité. Ce projet a été réalisé conjointement avec CANMET, novembre - décembre 1995.

Laboratoire Chrysotile inc.
C.P. 459
835 rue Mooney
Thetford Mines, QC
G6G 5T5

Project Title / Titre du Projet**Category /
Catégorie**

Yves Beauchamp
Ingénieur - Stabilité des Pentes

Phone (418) 338-7500
FAX: (418) 338-6648

Utilisation de la réflectométrie en domaine temporel (RDT) pour la surveillance des pentes de mine à ciel ouvert 3,12

Le RDT est une technique de détection et de surveillance des mouvements à l'intérieur de masse rocheuse (pentes-pilier de surface). L'outil consiste en un câble co-axial cimenté dans un trou de sondage. Toute déformation de la masse rocheuse se communique au câble et est détectée par un appareil. Le projet consiste en l'amélioration des procédures d'installation du câble, de l'acquisition et de l'analyse des données brutes et en la calibration des signaux afin d'incorporer ces données dans un modèle numérique d'une pente réelle de mine à ciel ouvert.

Michel Labbe
Directeur des puits

Phone (418) 338-7500
FAX: (418) 338-6648

Localisation des camions par GPS 3,12

Mise en place d'un système de localisation des camions de halage en utilisant la technique du géopositionnement par satellites (GPS) pour augmenter la productivité en diminuant les délais.

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LaUn

Project Title / Titre du Projet**Category /
Catégorie**

**Dr. Waldemar W.
Koczkodaj**
Professor

Phone (705) 675-1151

FAX: (705) 673-6591

**Mineral Potential Assessment/Land Use Planning/Environmental
Assessment**

12

A consistency driven approach to assessment of mineral potential land use and environment by pairwise comparisons is used. In case of mineral potential geological, the local geological criteria is subdivided into stratigraphy, lithology, alteration and/or mineralization, and structure. Models implemented may include both tangible factors (such as geological parameters) and intangible factors (such as evaluation of informal relations of environmental issues). Considering the complexity of the assessment problem, a model of hierarchical structure is used. The pairwise comparisons method glues together performance measurements which may take place at many levels. The consistency-driven approach allows one to refine subjective judgements applied to exploration and land use planning.

Julian Partyka
Professor

Phone (705) 675-1151

FAX: (705) 675-4862

Blast-Induced Dust

13

The research is to study experimentally the respirable dust production during a mine blast in deep metal mines. Stopes applying cut-and-fill mining, VRM, and sublevel caving method are recorded. Transient pressure and velocity waves on dust flow are analyzed. Shock effects (air blast energy) is evaluated.

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LaUn

Project Title / Titre du Projet**Category /
Catégorie**

Ron Slater
Assistant Librarian & Chair, Technical
Service

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FAX: (705) 673-6524

Mining Environment Database**9**

The database is an online file of references for journal articles, conference papers, and government and consultant reports on acid drainage, tailings, abandoned mines, land reclamation and other topics related to the environmental impact of mines and mine closure. There are now over 20,000 references. A CD-ROM stand-alone version is also available. The online version is accessible on the internet with the telnet address: `Libr.laurentian.cg,username:NETLIB`

Laurentian University
Department of Chemistry & Biochemistry
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Project Title / Titre du Projet**Category /
Catégorie**

Nelson Belzile
Associate Professor

Phone (705) 675-1151
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Passivation of Pyrite Oxidation by Natural Products**3**

The oxidation of pyritic material that produce sulfuric acid and iron oxyhydroxides is one of the major environmental problems facing the mining industry and various government agencies in Canada. This problem has stimulated many research projects dealing with the factors affecting pyrite oxidation rates such as pH, temperature, particle size and oxygen partial pressure. Among the different solutions proposed to solve the problem there is one suggesting the inhibition of pyrite dissolution by surface treatment. In this study, samples of pyrite from two origin were examine in the presence of two oxidizing agents: hydrogen peroxide and air. Coating agents such as sodium silicate, acetyl acetone, oxalic acid, humic acids and lignin have demonstrated that they can significantly decrease the oxidation rate by forming a passive thin layer on pyrite particles. A pre-oxidative treatment notably increases the efficacy of the coating agents in preventing the oxidation of pyrite by hydrogen peroxide.

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Project Title / Titre du Projet**Category /
Catégorie**

Dr. E. Douglas
Goldstack
Professor, Executive Director

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FAX: (705) 673-6508

Physical Chemistry of Cementation Mechanism of Mineral Fines**3,11**

Paste fill materials include a significant fraction of fines materials some of which are inert and some of which are reactive depending on the mineral composition of these fines. Strength enhancing and inhibiting characteristics of these mineral fines is necessary for the production of cheap backfill material as well as for a fundamental understanding of cementation mechanisms in these materials and thus their improved strength characteristics.

Dr. L.D. Reed
Physics Professor

Phone (705) 675-1151

FAX: (705) 675-4868

Sound and Miscellaneous Emissions During Rock Fracture**5,12**

Novel properties of sound and the emission of charged particles during rock fracture and comminution have been studied with simple sensors with the intent of increasing the efficiency of drilling and grinding techniques.

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LaUn

Project Title / Titre du Projet**Category /
Catégorie**

S.P. Singh
Professor

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Blast Damage Control in Underground Mines**11,7**

Effective application of tracer blasting in development and stoping operations.
Causes implications and control of blasthole deviation.

Nick Vagenas
Associate Professor

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FAX: (705) 675-4862

**3-D Simulation of Stopping Methods and Equipment Systems for
Automated Underground Hard Rock Mining (NSERC 1995-97)****12**

This is a collaborative research among LUMAL, McGill University and INCO Limited. The project aims to model the automated mining process. It will simulate the interaction between the machine system and the mining method. The efficiency, versatility and reliability of automated systems will be evaluated.

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Project Title / Titre du Projet**Category /
Catégorie**

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Amaratunga
Professor

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FAX: (705) 675-4862

Sulphide Dust Explosions**13,6**

Fundamentals and particulate aspects of sulphide dust explosions are studied. Sulphide mineral dusts and their ignition behaviour are examined using laboratory high temperature furnaces.

Development of Total Tailings Paste Fill Using Tailings Agglomerates as Aggregate**6**

Agglomerated fine tailings by the CBTA technique is used as gravel and particulate component with a tailings matrix to produce high strength, high density paste fill. The process is a total tailings utilization and disposal technique with several environmental benefits.

Development of Cold Bond Tailings Agglomeration (CBTA) Technology**6**

Fine tailings are agglomerated using low cost cementitious binders by cold-bonding. Agglomeration by disc and drum pelletization, pressure agglomeration by briquetting, and extrusion are studied. Curing and strength characteristics of agglomerates are investigated. The process has several environmental benefits.

Laurentian University
Tailings Agglomeration Research Laboratory
Ramsey Lake Road
Sudbury, ON
P3E 2C6

Project Title / Titre du Projet	Category / Catégorie
Prevention of AMD by Tailings Agglomeration	3,6
The cold-bond tailings agglomeration (CBTA) technique is studied using alkaline binders encapsulating bactericidal, acid neutralizing and oxidation inhibiting additives. Stability of cold bonded reactive tailings agglomerates are studied for their ability to prevent acid generation. Bench scale AMD testing methodology including humidity cell testing is carried out.	

Lynx Geosystems Inc.
400-322 Water Street
Vancouver, BC
V6B 1B6

LyGe

Project Title / Titre du Projet**Category /
Catégorie**

Garth Kirkham
V.P. Sales and Marketing

Phone (604) 682-5484
FAX: (604) 669-3659

Lynx Geoscience Modelling System and microLynx+**12**

The Lynx Geoscience Modelling System and microLynx+, an inexpensive integrated Mining Software Package for PC's, are easy to use yet very comprehensive geoscience software tools. Both applications are specialized in 3D subsurface modeling for use in areas of data management, geostatistical analysis, geological modeling as well as surface and underground excavation design. Lynx and microLynx+ offer a full range of modeling capabilities for site characterization, investigation and assessment in a wide variety of environments and applications including mining, tunneling projects, and also environmental restoration activities.

Machines Roger International Inc.
C.P. 818
1161 des Manufacturiers
Val d'Or, QC
J9P 4P8

Project Title / Titre du Projet**Category /
Catégorie**

Lucien Grenier
Vice Président

Phone (819) 825-4657
FAX: (819) 825-0968

Foreuse V-30 et mât**5,12**

I-V30: Développement d'une foreuse de monteries percussive en mode conventionnel, "down reaming" et "blind boring".

II-MQat: Développement des équipements de traction requis à son fonctionnement selon ces trois modes.

McGill University
Department of Mining and Met. Engineering
3450 University Street
Montréal, QC
H3A 2A7

Project Title / Titre du Projet**Category /
Catégorie**

Dr. Hani S. Mitri
Professeur

Phone (514) 398-4890
FAX: (514) 398-7099

Numerical Simulation of Groundwater Flow in Fractured Rock Masses 11

A model of groundwater flow through fractured rock masses is developed using a continuum approach with double porosity simulation. The development of a numerical model is currently, underway, using finite element method, to model groundwater flow under various field conditions. A wide range of boundary conditions such as pumping wells, drain holes, etc. are considered. The model calculates flow nets in fractured rock masses, and together with a stress analysis program, can make a powerful design package for open pit slope stability problems.

Influence of Groundwater on Stability of Rock Mass Structures 11

This project concerns itself with the development of specialized design strategies that can prove useful in the assessment of rock mass response in the presence of groundwater, e.g. in open pit mines and shallow underground mines. A combined effective stress-finite element technique is developed to help evaluate such critical parameters as stresses, displacements, safety levels and excess pore water pressure in saturated and partially saturated rock masses. Other contributing factors like rock mass mechanical and physical properties and in situ stresses are also considered.

McGill University
Department of Mining and Met. Engineering
3450 University Street
Montréal, QC
H3A 2A7

Project Title / Titre du Projet	Category / Catégorie
Modélisation numérique tri-dimensionnelle des chantiers d'abattage remblayés	11
<p>Ce projet a pour objectif de mieux comprendre le rôle du remblayage en pâte dans la conception géomécanique souterraine pour le contrôle des coups de terrain dans la mine Chimo. Pour ce faire, les chercheurs ont effectué des analyses tri-dimensionnelles par éléments finis qui permettent de comparer les régimes de contraintes, les constrictionnements des parois et les indices de stabilité, en l'absence ainsi qu'en présence de remblayage en pâte. Les chercheurs ont procédé en premier lieu à la collecte de toutes les données géomécaniques et microsismiques. Les propriétés physiques et mécaniques du remblayage utilisé à l'heure actuelle revêtent une importance primordiale. Sur la base des données recueillies, une série de modèles tri-dimensionnels par éléments finis a été constituée dans le but de modéliser la vérification et la calibration avec des observations et des mesures de terrain. Ce projet fut réalisé à l'aide du logiciel GENA3D mis au point par l'université McGill.</p>	
Time Dependent Modelling of Backfilled Stopes with Bolts in Soft Rock Mines	11
<p>The research work develops and implements numerical techniques which proves useful in the time dependent stress-displacement simulations of such situations as the presence of several rock strata in the vicinity of the mine openings, mining in sequences and the placement of backfill and rock bolts. The effect of backfill as a material compacting with time on the conditions of mine cavities is modelled. The distributions of bolt forces along their length and with time are also examined.</p>	

McGill University
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Project Title / Titre du Projet**Category /
Catégorie**

Rockburst Control Using Destress Blasting**11,13**

This project aims to develop numerical modeling techniques for evaluating destress blasting as a means of controlling rockburst in deep underground hard rock mines. The procedure is based on finite elements together with mining-induced strain energy as a critical indicator of burst potential. The method is presently being applied to Sigma Mine, Québec where it seems to be useful in the identification of potential burst zones and in the assessment of the effectiveness of destress blasting. Coupled with field data, the technique can provide a promising design tool to practising engineers.

Stress and Deformation Analysis of Tailings Dams**4**

This research is focused on the development of a computer-aided design tool, for mine waste tailings dams. The finite element technique is used to analyze the nonlinear state of stress and deformation. The model takes into consideration the physical and engineering properties of the mine waste, dam geometry as well as the method of waste deposition. Interactive link with seepage analysis is also developed. The new design tool can be helpful not only for the initial design phase, but also to study the behaviour during construction (short-term), and operation (long-term).

McGill University
Department of Mining and Met. Engineering
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Montréal, QC
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Project Title / Titre du Projet**Category /
Catégorie**

Malcolm J. Scoble
Director of Mining

Phone (514) 398-4374
FAX: (514) 398-7099

Orebody Delineation Influence on Mining Performance**7**

Classification orebody types according to complexity and other parameters. Influence of orebody declination intensity and reliability on the selectivity and recovery associated with various stoping methods underground. Field studies undertaken at Inco Mines accompanied by orebody modeling and mining simulation.

Systems Safety in Underground Mining Automation**7**

Study of the factors influencing systems safety associated with the progressive implementation of automation and remote control. Primarily concerned with mobile machines (LHD's, trucks etc...) and their interaction with each other as well as personnel on foot or driving other vehicles. In collaboration with mining companies, manufacturers and ONRSA.

Simulation for Design of Automated Mining Systems**12**

To develop an approach to simulating operating environments for potential automated underground mining systems (comprising drilling, blasting, support and materials handling machines). Simulation of the performance of a range of automated systems and methods in different orebody settings (joint project between Laurentian University, Inco Ltd., Ontario Division and McGill University).

McGill University
Department of Mining and Met. Engineering
3450 University Street
Montréal, QC
H3A 2A7

McUn

Project Title / Titre du Projet	Category / Catégorie
Optimization of Raise Borer Performance	7
Joint collaborative project with Inco Ltd./Mine Research, Sudbury. Field monitoring of raise borer performance in various underground mines to relate performance parameters to geological and operational factors.	
Characterization of Excavation-induced Rockmass Damage	7
Development of a methodology to quantify damage induced by blasting and machine mining in development and stoping underground. Definition of the damage mechanisms evident in various geological settings	

Michael Cullen and Associates
R.R. 2, Site 298 C12
Courtenay, BC
V9N 5M9

Project Title / Titre du Projet**Category /
Catégorie**

Michael Cullen
Principal

Phone (604) 338-3889
FAX: (604) 339-2003

Optimization of Underground Layout and Design**4,7**

Optimization of excavation design (span, pillar size, support) and extraction sequence at the Quinsam Coal Mine. Investigation of caving and subsidence over shallow, heavily faulted coal mines.

Miller Minerals
P.O. Box 248, Highway 11B North
New Liskeard, ON
P0J 1P0

MiMi

Project Title / Titre du Projet**Category /
Catégorie**

Garry Bell
Manager

Phone (705) 647-4390
FAX: (705) 647-3611

**Slaking Characteristics and Neutralization Capacity of Lime at
Dymond Clay Products Limited**

2,7

The objective of this project was to identify and rectify operational problems of a kiln designed to produce slaked lime for use in the treatment mining effluent; to evaluate the effectiveness of the product as a neutralizing agent; and to improve the quality of the finished lime produced by the kiln. The project was jointly funded by the Northern Ontario Development Agreement (NODA) and Dymond Clay Products Limited, the owner of the kiln and the limestone deposits being tested.

Mines et exploration Noranda inc.
Division Mines Gaspé
53, Chemin de la mine
Murdochville, QC
G0E 1W0

NoIn

Project Title / Titre du Projet		Category / Catégorie
Patrice Cayouette Directeur général		Phone (418) 784-2541 FAX: (418) 784-3805
Usine-Pilote pour le traitement des minerais oxydés		6,7
Construction d'une usine-pilote pour le traitement du minerai de cuivre oxydé dans le but d'en récupérer les valeurs minéralisées par la méthode lixiviation-extraction par solvant et électrolyse. (La mise en opération de l'usine-pilote se fera en juin 1996).		
Projet d'injection des concentrés du cuivre		7,12
Système de manutention et d'injection de concentrés de cuivre directement dans les convertisseurs. (La mise en opération: début de juin 1996).		

Mining Resource Engineering Limited
1555 Sydenham Road, R.R. #8
Kingston, ON
K7L 4V4

Project Title / Titre du Projet**Category /
Catégorie**

A.W. (Bill) Bauer
General Manager

Phone (613) 545-0466
FAX: (613) 542-8029

"DataTrap" Design and Production**12**

Design and production of a multi-purpose data recorder which uniquely operates under the extreme temperatures, weather conditions and rugged environments typical of the mining industry world-wide. The "DataTrap" is a stand-alone portable field system for monitoring: explosives detonation velocity, blast vibration, pressure, temperature and DC voltage.

Ministère des Ressources naturelles
5700, 4e avenue, Ouest
Local A-214
Charlesbourg, QC
G1H 6R1

MiRe

Project Title / Titre du Projet		Category / Catégorie
Jean-Marc Charbonneau Chef du Service de la géoinformation		
Phone (418) 646-2396 FAX: (418) 643-2816		
SIGÉOM - Système d'information géominière du Québec		6,9
Système à référence spatiale intégrant les données géologiques, géochimiques, géophysiques et minières (installations, travaux d'exploration, forages au diamant, gîtes minéraux). Amorcé en 1992 et actuellement en phase finale de développement et en phase active de numérisation de données. Les produits disponibles peuvent être commandés au Centre de diffusion du ministère des Ressources naturelles au 5700, 4e Ave., O., Charlesbourg, Québec, G1H 6R1; tél.: 418 643-4601, fax.: 418 644-3814.		

Ministry of Employment and Investment
Geological Survey Branch
1810 Blanshard Street
Victoria, BC
V8V 1X4

MiEm

Project Title / Titre du Projet		Category / Catégorie
Barry Ryan Senior Coal Geologist		Phone (604) 952-0418 FAX: (604) 952-0381
Sulphur Distribution in a Coal Seam from the Telkwa Property, Northwest B.C.		3
The vertical distribution of sulphur, organic and pyritic material across a coal seam will be analysed in relationship to petrographic studies.		
Coal Quality Variation on the Sething Formation NE, B.C.		3
The Sething Formation outcrop's on a large area in the Peace River Coalfield, NE B.C. Variations in ash chemistry and petrology will be discarded, because wrong data were extracted from poor exploration reports.		
Phosphorus Distribution in Mist Mountain Formation		3
A previous study looked at the phosphorus distribution on the regional scale. This study will look at the lateral and vertical distribution of phosphorus in coal seams and through Mist Mountain Sections in Southeast, B.C.		
CBM Content of Coals from the Tsable River Area Vancouver Island, B.C.		3
Drill core samples will be degassed and an estimate of the CBM resources will be made for upper cretaceous coals in the Tsable River Area, Vancouver Island, B.C.		

Ministry of Employment and Investment
Geological Survey Branch, Energy & Minerals
Division
1810 Blanshard Street, 5th Floor
Victoria, BC
V8V 1X4

Project Title / Titre du Projet**Category /
Catégorie**

Larry Jones
Senior Geologist, MINFILE

Phone (250) 952-0386
FAX: (250) 952-0381

Minfile (B.C. Mineral Inventory)**3,9**

Minfile is British Columbia Geological Survey Branch's computerized mineral inventory system of over 11,600 metallic minerals, industrial minerals and coal occurrences. The database contains geological, locational and economic information. The information is used for geoscience research, mineral exploration, resource evaluation, and land-use planning. Minalelpe a menu-driven data entry, search and report program for IBM - compatible computer, accesses the database. The program is free; the data is sold for \$7.50 per diskette (or \$75 for all data on 15 diskettes; and maps are \$5.00 each).

Ministry of Northern Development and Mines
933 Ramsey Lake Road
8th Floor
Sudbury, ON
P3E 6B5

MiNo

Project Title / Titre du Projet		Category / Catégorie
Andy Bajc Geoscientist		
Phone (705) 670-5960 FAX: (705) 670-5953		
Multi-Media Geochemical Sampling in Areas of Thick Overburden: A Case Study		3
The current study involves elements of hydrogeology and glacial stratigraphy to: confirm the presence of the anomalies and extend the depth of investigation to the bedrock surface; investigate the geochemical process(es) involved in the upward dispersion of elements from the ore deposit; characterize, in 3 dimensions, the geochemical dispersal train in till from known gold mineralization in an area of complex glacial stratigraphy; and investigate the interaction between media types sampled. This project is funded by the Northern Ontario Development Agreement (NODA).		
J.A. Fyon Senior Manager		
Phone (705) 670-5992 FAX: (705) 670-5953		
Research and Development of Forward Modelling, Inversion and Imaging Tools for Electromagnetic Methods		3,12
The goal of this project is to develop easy to use, rapid, forward, inverse and imaging computer programs for airborne, ground and borehole electromagnetic methods. The software will be developed to execute on either a higher-end DOS computer platform or a UNIX work station. The programs analyze the data in minutes, rather than the currently required hours or days with conventional electromagnetic scattering equations, the equations are solved using a new nonlinear approximation technique that was invented by one of the contractors. This project is jointly funded by the Northern Ontario Development Agreement (NODA) and the Mining Industry Technology Council of Canada (MITEC).		

Ministry of Northern Development and Mines
933 Ramsey Lake Road
7th Floor
Sudbury, ON
P3E 6B5

MiNo

Project Title / Titre du Projet	Category / Catégorie
Borehole Geophysical Studies of the Hemlo Deposit	3
<p>A comprehensive study of the geophysical parameters of the Hemlo gold deposit has been undertaken to complement the integrated geological bedrock studies being carried out. Borehole logging of holes from a minimum of three profiles across the deposit is underway to assist in constraining geophysical models of the Hemlo deposit, to determine the usefulness of borehole methods at various stages in an exploration project and to derive a model of the 3 dimensional stratigraphy of the deposit based on geophysical logs. This project is jointly funded by the Northern Ontario Development Agreement (NODA) and the Mining Industry Technology Council of Canada (MITEC).</p>	
<p>Michael Charette Consultant</p>	<p>Phone (705) 670-5821 FAX: (705) 670-5803</p>
Collection, Cataloguing and Analysis of Ontario Inactive Mine Data	3
<p>The scope of this project was to locate, collect, classify and store files, plans and reports on past mining operations in the province in one secured storage area. This hard copy information is stored in digitized format in an Inactive Mines Database System (IAMIIS) through the Canadian Centre for Mineral and Energy Technology (CANMET) and the Northern Ontario Development Agreement (NODA). Because of centralized safe storage of irreplaceable inactive mine data, this project is providing beneficial access of mine data to the mining industry and the governments of Ontario and Canada for mine reclamation, mineral exploration and development. The IAMIIS work station currently allows access to textural as well as 2 and 3 dimensional information on underground mine workings, tailings and surface features for the analysis of long-term stability parameters and emergency response planning.</p>	

Mintronics Systems Corporation
191 Booth Road
North Bay, ON
P1A 4K3

MiSy

Project Title / Titre du Projet**Category /
Catégorie**

Glen Brophey
President

Phone (705) 495-4000
FAX: (705) 474-9041

Multiple Automatic Haulage Trucks c/w Traffic Control**4,12**

Two automated haulage trucks will share a common ramp with manned vehicles at TVX Gold's Casa Berardi Mine. Included in the application is a traffic control system to manage the interactions of the various vehicles.

National Compressed Air Canada Ltd.
1165 Fewster Drive
Mississauga, ON
L4W 1A2

NaCo

Project Title / Titre du Projet	Category / Catégorie
David Keddie President	Phone (905) 625-7321 FAX: (905) 629-1271
Booster Compressors for High Pressure Drilling	5
<p>National Compressed Air Canada Ltd. has developed a series of oil flooded screw booster compressor designed to boost piped mine air from nominal pressure of 70 to 100 PSIG to pressures of 350 to 450 PSIG. Patents have been applied for an registered in many of the design features. The compressors offer many significant advances over traditional technology, and can significantly increase production and accuracy of underground drilling. Tests are continuing to higher pressures and capacities. Prime mover (drive) is electric motor, and/or underground diesel package. Booster compressors are also used in conjunction with surface drilling.</p>	
Large Diameter Percussion Drilling (Uphole and Downhole)	5
<p>National Drilling Systems has developed a specialized In the Hole Hammer Drill Rig for use in underground mining for drilling of hole diameters of up to 30" in diameter down hole, and 17 1/2" diameter uphole. The new equipment has opened up new opportunities in mining development both for production blast hole drilling and infrastructure hole on a more cost effective basis, and with higher production rates.</p>	
<p>NDS also offers contract drilling services using the above technology.</p>	
<p>Reverse circulation optimal technology will be adapted to the drill rig in further testing and development.</p>	

Natural Resources Canada
CANMET/MMSL, Coal Mining Health and Safety
210 George Street
Sydney, NS
B1P 1J3

NRCa

Project Title / Titre du Projet	Category / Catégorie
Dr. Dave J. Forrester Program Manager	Phone (902) 564-7673 FAX: (902) 539-8300
Mine Fire Gas Analysis Transportable Unit	13
Transportable gas chromatography unit to supports mine rescue operations in a mine fire.	
Longwall Research Program	11,13
Geotechnical and ventilation studies in a new seam to optimize design.	
Joint Collaborative Mining/Research	11,13
Safety related research into underground coal mining projects; ventilation and methane control; longwall periodic weightings; geotechnical monitoring of trial gateroad drivages; sandstone/gas outbursts; and seafloor subsidence.	
Optimization of Mine Design	11,13
Geotechnical studies to optimize panel and pillar design in a room and pillar gas operation including subsidence and caving.	
Instrumentation Development	11
Geotechnical and ventilation instrumentation for underground coal mines.	

Natural Resources Canada
CANMET/MMSL, Coal Mining Health and Safety
210 George Street
Sydney, NS
B1P 1J3

Project Title / Titre du Projet**Category /
Catégorie**

Computer Software for Mine Rescue Training**12,13**

Development of computer distance training software for internet application of mine rescue exams plus virtual reality simulation for mine rescue training.

Natural Resources Canada
CANMET/MMSL, Mining Laboratory
Haanel Dr.
Nepean, ON
K1A 0G1

Project Title / Titre du Projet**Category /
Catégorie**

Behrouz Arjang
Research Scientist

Phone (613) 947-1585
FAX: (613) 995-3456

Database on In Situ Stress Values**10**

Stress value determinations have been made by CANMET researchers at a number of Canadian mines. These values are continuously added to a database. Publication of an updated stress measurements handbook for Canadian mines is being prepared for issue in 1997.

Mahe Gangal
Research Scientist

Phone (613) 996-6103
FAX: (613) 996-2597

**Ambient Diesel Emissions Instrumentation Development and
Assessment****13**

Based on the extensive field monitoring experience, developed instrumentation for monitoring ambient pollutants, such as multi-gas monitoring system equipped with sophisticated software to provide accurate data by compensating for gas interference, temperature and humidity changes; vehicle dash-mounted device to indicate emissions overexposure to operator. Presently developing instrumentation for DPM (Diesel Particulate Matter). The facility includes a total exhaust dilution system permitting assessment of mine environment sampling systems under controlled laboratory conditions.

Natural Resources Canada
CANMET/MMSL, Mining Laboratory
Hannel Dr.
Nepean, ON
K1R 7C5

NRCa

Project Title / Titre du Projet	Category / Catégorie
Diesel Emissions Reduction Device R&D and Performance Assessments of Fuel and Emissions Reduction Devices	13
<p>In cooperation with numerous agencies, developed and assessed several emissions control devices (Baffle-type water scrubbers, Venturi scrubbers, ceramic wall-flow exhaust filter) in the effort to reduce emissions at source. The performance of various fuels for exhaust emissions is performed using 8-mode and CANMET's LHD and truck cycles. The facilities are well equipped to undertake other standards for assessment also.</p>	
Diesel Engine Emissions Assessments for Mining Equipment Certification and General R/D Purposes	13
<p>Since 1970, diesel emissions facility has been providing this service to the mining community. The facility includes a 4000rpm, 400bhp electric dynamometer, and a portable water brake dynamometer for engines with a convenient power take-off connection. Emissions analysis system includes O₂, CO, CO₂, NO, NO₂, SO₂, total hydrocarbons and DPM (Diesel Particulate Matter). The emissions data bank includes emissions on various mining engines.</p>	
Dr. Gerhard Herget Research Scientist	Phone (613) 996-4027 FAX: (613) 995-3456
Shaft Stability of No. 6 Shaft, MSV Ressources Inc. Chibougamau, Québec	11
<p>Analysis of shaft wall stability and remedial measures based on rocktesting monitoring, mapping and numerical monitoring.</p>	

Natural Resources Canada
CANMET/MMSL, Mining Laboratory
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Project Title / Titre du Projet**Category /
Catégorie**

Denis Labrie
Project Leader

Phone (613) 995-3986
FAX: (613) 995-3456

Creep Testing of Weak Rocks**10**

Laboratory methodologies are being developed for properties testing for weak rocks such as schists and sheared specimens. The research is intended to produce protocols to provide reproducible results for all important rock property values as well as evaluation of creep parameters.

Eric Leung
Research Scientist

Phone (613) 992-6792
FAX: (613) 996-2597

Mine Ventilation Automation - Ventilation on Demand**4,6**

This is an ongoing project involving various industry partners, mineral producers, industrial research organizations, and equipment manufacturers. The Experimental Mine at Val d'Or is being used as a show case for ventilation on demand where levels of ventilation are event driven. The system will incorporate vehicle tracking, ventilation and gas monitoring control of regulators, main and auxiliary fans, and appropriate alarms.

Wire-rope Testing Instrument - Computerization**13**

Computerization of non-destructive testing instrument based on Hall effect sensors for mine hoist-ropes. Provide services on equipment setup and calibration. Also provide system setup for continuously monitoring of wire-rope to track deterioration.

Natural Resources Canada
CANMET/MMSL, Mining Laboratory
Haanel Dr.
Nepean, ON
K1A0G1

NRCa

Project Title / Titre du Projet**Category /
Catégorie**

Jim Vance
Program Manager

Phone (705) 461-7010
FAX: (705) 848-9788

Inactive Mines Project**13**

The objective of this project has been to develop a methodology for permanent storage and easy retrieval of important drawings and records of inactive mines. This information could be required by civil authorities in an emergency when instability or failures develop. The information is available for post mining land use planning. The project has included development of methods for evaluating the potential for ground failure and other site specific risks.

Somchet Vongpaisal
Senior Research Scientist

Phone (613) 996-4302
FAX: (613) 995-3456

Expert System for Sill Pillar Recovery Strategies**11**

An expert system approach is being developed for coordination of knowledge of numerical modeling, geomechanics, rockburst hazards and mine planning to aid in optimum mining design for recovery of still pillars. Issues such as sequencing of removal and blast will be considered. The research includes in situ testing of parameters for model input and for later verification of results.

Natural Resources Canada
CANMET/MMSL, Mining Laboratory
Hannel Dr.
Nepean, ON
K1A 0G1

NRCa

Project Title / Titre du Projet	Category / Catégorie
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Baolin Wang
Research Scientist

Phone (613) 996-6927
FAX: (613) 995-3456

Development of Block Spring Model

11

The Block Spring Model is a recently developed technique for analyzing the stress and deformation of jointed rock masses. The model simulates the rock mass using an assemblage of blocks which in turn represent naturally formed discontinuities within the rock mass. BSM is particularly well suited for: the analysis of stresses and deformations in jointed rock masses; rock blocks undergoing large displacements; and the prediction of unstable blocks around mine openings. Work in progress involves production of a version with deformable blocks and refinement of the model through application to practical field cases.

Yang S. Yu
Senior Research Scientist

Phone (613) 996-1809
FAX: (613) 995-3456

Ground Stability Assessment for Very - Large-scaled Mine (Rock) Structures using Three Dimension Finite Element Method

11

An advanced pre- and post-processing modules - ROCK3DFE Workbench, has been implemented to speed up data preparation and result analysis thus making the system suitable for routine use in ground control and mine planning. In addition, seismic source locations and magnitudes can be displayed either in 3-D space or projected on sections or horizontal plans by importing the seismic data. This can be compared to stresses or mining-induced strain energy in identifying rockburst hazards.

Natural Resources Canada
CANMET/MMSL, Mining Laboratory
Haanel Dr.
Nepean, ON
K1A 0G1

Project Title / Titre du Projet**Category /
Catégorie**

Development of a Large 3D Numerical Model**11**

A new code, called Rock3D, has been developed to improve the capacity and calculation time for 3D numerical modeling. For linear elastic conditions, a model of one million elements can be solved to convergence in approximately 24 hours. Current research includes development of non-linear capability, with future plans to accommodate plastic.

Natural Resources Canada
CANMET/MMSL, Sudbury Laboratory
1079 Kelly Lake Road
Sudbury, ON
P3E 5P5

NRCa

Project Title / Titre du Projet**Category /
Catégorie**

Stephen Hardcastle
Research Scientist

Phone (705) 677-7810
FAX: (705) 670-6556

3D-CANVENT - A User-friendly Mine Ventilation Simulator**4,9**

Fine tuning of the program continues within this project. The program which integrates advanced computer aided design (ACAD) 3D graphics, a graphical user interface and ventilation simulation into a self-sufficient Windows based package that quickly permits mine ventilation technicians to test new ventilation scenarios. Current work on this program involves further optimizing the data input and output and suggested modifications from users worldwide.

Mine Ventilation Automation - MIC-L Expert System**4,6**

This is an ongoing project that will develop a software package that bridges supervisory control and data acquisition (SCADA) and ventilation design/optimization with a simulator. MIC-L a monitoring information and control logic can be programmed with user-defined flow criteria such as minimum levels of ventilation and production levels of ventilation according to Provincial/CSA diesel regulation or an air quality standard. The control logic knows the options by which a ventilation system can be adjusted such as fans, doors and regulators, and uses a mine ventilation simulator to search for the optimum solution.

Mine Ventilation Control**4,12**

This project is in the final stages of evaluation. The project was responsible for the development of a reliable ventilation regulator with remote and wireless control that could be incorporated into an automated mine ventilation system. The regulator is an adaptation of the MandI Doors rotary man door has been installed at the Val d'Or Experimental Mine for evaluation.

Natural Resources Canada
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Sudbury, ON
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NRCa

Project Title / Titre du Projet	Category / Catégorie
Optimization of Mine Ventilation Circuits	2,4
<p>This is an ongoing project that aids industry in optimizing the design of their ventilation system with respect to cost and pollutant control within this project numerous mines have been surveyed, modeled and redesigned to be more efficient. Mines have used this research option during expansion (Placer Dome - Dome Mine, Barrick/Cambior - Doyen Mine), to design new mine (Smoky River Coal, Battle Mountain - Holloway Joint Venture, Met-Chem and Indian Coal Mine), to restructure their existing infrastructure (Strathcona Minerals - Nanisivik Mine) or purely provide recommendations on redesign (MSV - Copper Rand Mine, Meston Resources).</p>	
Ventilation and Air Analysis	4,6
<p>This is an ongoing project that uses innovative tracer gas techniques and other instrumentations to evaluate aspects of mine ventilation systems. Examples being: the testing and evaluation of stench gas warning systems (Placer Dome - Detour Lake, and INMET - Winston Lake), determination of fume clearance rates and isolating leakage in or between mine ventilation systems such as through rock filled stopes (Williams Mine) or old working areas (Placer Dome - Paymaster Mine).</p>	
Mine Ventilation Based on Air Quality	5,7
<p>This specific project is aimed at characterizing the airborne pollutant burden in a north western Québec mine. This information will be used along with diesel fleet and ventilation network data to optimize the mine air quality. In a final phase, the possibility of applying some degree of control and/or automation to the mine ventilation circuit will be studied and implemented based on economic considerations.</p>	

Neill and Gunter Limited
191 Prospect St. W.
Fredericton, NB
E3B 5B4

NeGu

Project Title / Titre du Projet**Category /
Catégorie**

Paul J. Brooks
Project Manager

Phone (506) 452-7000
FAX: (506) 452-0112

Engineering Design for a Ferric Chloride Leaching Plant**4**

Preliminary design, cost estimates (capital and operating) and financial analyses for a plant to recover zinc, lead, copper and silver from typical complex sulphide ores using ferric chloride leach technology.

New Era Engineering Corporation
Northern Mining and Energy Specialists
Box 4491
Whitehorse, YK
Y1A 2R8

NeEr

Project Title / Titre du Projet**Category /
Catégorie**

Randy Clarkson
President

Phone (403) 668-3978
FAX: (403) 668-3978

Use of Tracers to Locate Gold Lock-Up in Mills**3,7**

We are currently using radioactivated gold particles as tracers to locate and eliminate gold lock-up in mineral processing circuits of Canadian and U.S. Mines. The radiotracers provide a cheap, safe and rapid method of improving security and reducing gold losses.

Noranda Mining and Exploration
Brunswick Mining Division
P.O. Box 3000
Bathurst, NB
E2A 3Z8

NoMi

Project Title / Titre du Projet		Category / Catégorie
<hr/>		
James Smith Mine Cadd Supervisor	Phone (506) 546-8671 FAX: (506) 547-6142	
Survey Analysis and Mapping		7,12
3D Model of all underground openings.		
Dilution Analysis		7,12
Scan 3D blast design tiles to produce database files from wall rock dilution.		
Ore Body Modeling		7,12
Diamond drill hole database, 3D plotting ore body definition and microblock database.		

Noranda Mining and Exploration Inc.
Brunswick Mining Division
P.O. Box 3000
Bathurst, NB
E2A 3Z8

Project Title / Titre du Projet	Category / Catégorie
Glen Crowther Chief Mine Engineer	Phone (506) 546-6671 FAX: (506) 547-6142
Paste Fill Slurry	2
Feasibility Study on the application of paste fill versus cemented rock fill underground.	
Development in Unconsolidated Fill	6
Development through unconsolidated backfill as a means to recover sill pillars.	
William Luff Chief Geologist	Phone (506) 546-6671 FAX: (506) 547-6142
Geochemistry and Mineralogy of Indium and other Metals	12
The Brunswick No. 12 mine is a world class deposit with reserves in Zn, Pb, Cu, and Ag. The deposit contains reserves of other commodities - Indium, Gold, Gallium, and Tin. These minerals may not be recovered, but may be an important resource. The first step is to determine the form, distribution and abundance of above metals as first step for economic recovery.	

Noranda Mining and Exploration Inc.
Brunswick Mining Division
P.O. Box 3000
Bathurst, NB
E2A 3Z8

Project Title / Titre du Projet	Category / Catégorie
Julia Martin Mine - Mechanical Engineer	Phone (506) 546-6671 FAX: (506) 547-6142
Shotcrete Mechanization	5
Determine the most efficient way to mechanize shotcreting for ground control purposes.	
Shotcrete Mechanization	8
Determine the best way to store and handle large quantities of shotcrete in a mine with shaft access only.	
Dale Petrie Ventilation Planner	Phone (506) 546-6671 FAX: (506) 547-6142
Mine Ventilation by Demands: Totally Controlled Ventilation Circuits - Volumes and Quality Monitoring Instrumentation	13
This project is also related to the CSA Standard CAN/CSA M424.2-M90. This concept will enable controlled recirculation circuits in a Mine Vent Circuit.	
Underground Diesel Emissions Monitoring	5,13
Acquisition of undiluted diesel emissions with respirable dust to control ventilation flow parameters in the mine, CSA Standard CAN/CSA M424.2-M90.	

Noranda Mining and Exploration Inc.
Brunswick Mining Division
P.O. Box 3000
Bathurst, NB
E2A 3Z8

NoMi

Project Title / Titre du Projet	Category / Catégorie
Brad Simser Ground Control Engineer	Phone (506) 546-6671 FAX: (506) 547-6142
Rockburst Risk Analysis (RRA)	11
Develop a RRA for Brunswick Mining including historical ground conditions, seismic data, geometry, geology, and support.	
Integrated Seismic System Expansion	12
Expansion of the South African developed integrated Seismic System from current 18 triaxial geophone stations to include an additional 14 triaxial sensors. Also, determine most suitable sensor type accelerometers versus high frequency geophones versus 4.5hz geophones. Improve automatic processing.	
Backfill Monitoring	10,11
Install instrumentation into backfill areas to monitor movements and/or potential caving. Lost sonic monitoring techniques for potential in characterizing unconsolidated and cemented rockfill properties on a continuous basis.	
Ground Support for Bursting Conditions	11
Evaluate existing support units and incorporate into suitable support systems for Brunswick Mining burst prone areas. Static and dynamic testing of yielding support (e.g. conebolts) both in situ and laboratory.	

Ontario Ministry of Environment and Energy
56 Wellesley Street West, 14th Floor
Toronto, ON
M7A 2B7

OnMi

Project Title / Titre du Projet**Category /
Catégorie**

George Zegarac
Assistant Director, Industry Conservation
Branch

Phone (416) 327-7702
FAX: (416) 327-1261

Green Industrial Heat Recovery Retrofit at Williams Operating Corporation**3**

With support from the Ontario Ministry of Environment and Energy to help cut emissions and save energy, Williams Operating Corporation in Marathon, Ontario, undertook a heat recovery project to recover heat from air leaving the mine and to reuse recovered heat in the fresh air supply. This would result in reduction in fuel used to heat the ventilation air which, in turn, would lower costs and reduce carbon dioxide and carbon monoxide released to the environment. For further details, a published project profile is available from the Ontario Ministry of Environment and Energy.

Ontario Ministry of Labour
Willet Green Miller Blvd.
933 Ramsey Lake Road
Sudbury, ON
P3E 6B5

ONLa

Project Title / Titre du Projet	Category / Catégorie
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Bernard K. Deck
Provincial Engineer, Mining

Phone (705) 670-5714
FAX: (705) 670-5898

Shaft Station Doors in Underground**13**

The project is to determine if Shaft Doors are designed to withstand the impact of Rolling Stock on the level.

PIIn

Placer Dome Inc.
Project Development
P.O. Box 49330 Bentall Stn.
#1400 - 1055 Dunsmuir St.
Vancouver, BC
V7X 1P1

Project Title / Titre du Projet**Category /
Catégorie**

John Brunette
Manager, Computer Services

Phone (604) 661-3755
FAX: (604) 662-7593

Open Pit Optimized Long-Term Scheduling**3**

Based on the work of Tolwinski and Underwood (Colorado Scholl of Mines) a forward search algorithm will seek the optimum discounted revenue schedule within staged production constraints.

Placer Dome Canada Ltd.
Campbell Mine
P.O. Box 10
Balmertown, ON
POV 1C0

Project Title / Titre du Projet	Category / Catégorie
Peter Mah Senior Planning Engineer	Phone (807) 735-2075 FAX: (807) 735-3149
Development of Empirical Design Techniques in Burst Prone Ground at A.W. White Mine	6,11
D.S.S. File No: 02SQ23440-1-9180, CANMET Project #: 1-9180, Scientific Authority: Dr. S. Vongpaisal, D.S.S. Contract # 23440-1-9180/01-SQ (3 volumes).	
Ken Dunne Ground Control Engineer	Phone (705) 245-3211 FAX: (705) 245-3267
Development of Design Guidelines for Narrow Vein Captive Open Stope Mining	11
Mining prior to 1993 was primarily by mechanized cut-and-fill, however, due to the mining of deeper, steeper and narrower ore zones, the majority of current production is by longhole techniques between the 460-660 metre levels. Detour Lake Mine is in the process of mining the 885 stope block which will represent approximately 30% of the total mine production. The stope block is to be mined in four panels (each 45 metres in strike 660 haulage vertical) by captive blasthole methods with conventional drawpoints located at the 660 haulage level. This stope method is particularly sensitive to dilution due to the narrow stope widths. A ground control program will be implemented whereby the dilution will be quantified and related to cable support, blasting practices, stope geometry and mine sequencing among other parameters in order to maximize extraction and minimize dilution (Detour Lake Mine, P.O. Bag 2016, Timmins, ON, P4N 8M5).	

Placer Dome Canada Ltd.
Endako Mines Division
Endako, BC
V0J 1L0

PIDo

Project Title / Titre du Projet**Category /
Catégorie**

Donald J. Strickland
Project Metallurgist

Phone (604) 699-6211
FAX: (604) 699-7775

Cleaner Circuit Upgrade**7**

Upgrading cleaner flotation circuit with installation of five column flotation cells. This adds substantial capacity to the cleaner circuit providing higher recovery and consistent final concentrate grade, especially during periods while processing high clay or high grade ore types. Equipment is highly instrumented with PLC control. Project scheduled for commissioning [June 10th, 1996] update??.

Placer Dome Canada Ltée
Division Mine Sigma
300, 3e avenue est
Val d'Or, QC
J9P 4N8

PIDo

Project Title / Titre du Projet**Category /
Catégorie**

Gilles Gagnon
Ing. en Chef

Phone (819) 825-4182
FAX: (819) 825-4343

Tir de relaxation (1995-96)**11**

En collaboration avec la Mine-laboratoire de CANMET à Val-d'or, projet de relaxation d'un pilier de roche souterrain, en état de fortes contraintes, visant à relaxer le pilier pour raisons de sécurité et de récupération.

Potacan Mining Company
P.O. Box 5005
Sussex, NB
E0E 1P0

PoMi

Project Title / Titre du Projet**Category /
Catégorie**

C.J. Monahan
Sr. Rock Mechanics Engineer

Phone (506) 839-2146
FAX: (506) 839-2808

Surface Subsidence Monitoring at Potacan Mining Co.**11**

Monitoring of surface subsidence by annual surveys has been concluded over the mine workings at Potacan Mine since start up of mining in 1985. A recent project for the period 1993-95 was undertaken that involved annual measurements of vertical displacements with conventional precision levelling and measurement of horizontal displacements with a.p.s. A numerical model for subsidence prediction was also constructed. The University of New Brunswick (Dr. A. Chrzanowski) was the sub-contractor and performed the surveys and computer modeling.

Potash Corp. of Saskatchewan Inc.
Allan Division
Allan, SK
S0K 0C0

Project Title / Titre du Projet**Category /
Catégorie**

M. Molavi
Chief Mine Engineer

Phone (306) 257-3312
FAX: (306) 257-4240

Application of Composite Bolts in Potash Mining Excavations**11**

This was the fourth phase of a project started in 1992. In 1995 grouted composite bolts were installed and observed for short and long-term reactions to ground pressure.

Brian Roulston
Geotechnical Supervisor

Phone (506) 433-5445
FAX: (506) 433-8617

Stability of Large Salt Stopes**11,5**

The pillar, between the first two of a series of large salt stope on a new lower level, has been instrumented with deformation gauges and newly developed pressure cells. Data will be used to correlate a 3D computer model with respect to pillar loading as a result of mining.

Potash Corp. of Saskatchewan Inc.
New Brunswick Division
P.O. Box 1689
Sussex, NB
E0E 1P0

Queen's University
Department of Mining Engineering
Goodwin Hall
Kingston, ON
K7L 3N6

QuUn

Project Title / Titre du Projet		Category / Catégorie
<hr/>		
James F. Archibald Associate Professor, Associate Head	Phone (613) 545-2198 FAX: (613) 545-8597	
Consolidation of Mine Backfill using Partial Portland Cement Replacement by Ground Landall Waste Glass		11
Research is being conducted, using a wide variety of mine classified tailings and rock fill materials, into strength beneficiation achieved by replacing up to 35% of Normal Portland cement binder by ground municipal waste glass. Ground waste glass has been demonstrated to offer strong pozzolanic behaviour in backfill at a significant reduction in product cost versus NPC.		
W.F. Bawden Head of Department	Phone (613) 545-8553 FAX: (613) 545-6594	
Optimization of Cable Bolt Support		11
Laboratory program to evaluate constitutive behaviour of modified geometry cable bolts; implement in numerical design packages; field demonstrate the technology using both back analysis and forward design.		
Evaluation of Mine Induced Stress Change on Cable Bolt Support		11
A laboratory program to evaluate the effect of anisotropic mine induced stress change on cable bolt support.		
Development of Prototype Novel Instrumented Cable Bolt		11
A laboratory program to develop and test a new instrumented cable bolt to the prototype stage.		

Queen's University
Department of Mining Engineering
Goodwin Hall
Kingston, ON
K7L 3N6

QuUn

Project Title / Titre du Projet**Category /
Catégorie**

Testing and Modeling Paste Backfill**11**

Sample paste backfill from Golden Giant Paste Fill plant; test samples in laboratory to determine constitutive behaviour; model fill behaviour in typical underground applications.

Integrated - Seismic - Stress - Geomechanical Design**11**

Evaluate potential linkages between mine induced microseismic source parameters and parameters derived from numerical modeling and geomechanical mapping using multivariate statistics on a field database from Creighton Mine.

**Numerical Model Evaluation of Influence of Change in Mine Stiffness
on Rockburst Hazard****11**

Effect of change in mine stiffness with increasing extraction on local Rockburst hazard is evaluated using 3D numerical models calibrated to field case studies.

P. Katsabanis
Associate Professor

Phone (613) 545-2197
FAX: (613) 545-6597

Development of Predictive Blasting Model Using DDA**4**

Use of discontinuous deformation analyze (DDA) to describe rock failure under dynamic loading and the subsequent processes of throw and muck pile formation.

Quinsam Coal Corporation
P.O. Box 5000
Campbell River, BC
V2W5C5

QuCo

Project Title / Titre du Projet**Category /
Catégorie**

**Kresho Galovich, P.
Eng. C. Eng.
Manager Engineering**

Phone (604) 286-3224

FAX: (604) 286-9727

Geotechnical Design of Pillars**4,11**

Monitoring and Design of Pillars for long-term and short-term stability. Part of larger project "optimization of underground coal mining layout and support at Quinsam mine".

Quintette Operating Corporation
P.O. Box 1500
Tumbler Ridge, BC
VOC 2W0

QuOp

Project Title / Titre du Projet**Category /
Catégorie**

Al Kangas
Superintendent of Engineering

Phone (604) 242-3221
FAX: (604) 242-3140

Drill Automation**5,12**

The objective is to use GPS techniques to locate a drill hole without a stope. The operator will set up the system to drill automatically at the designed depth. All drill hole information is set to engineering on a real time basis.

Ressources Meston inc.
Mine Joe Mann
Case Postale 400
Chibougamau, QC
G8P 2X8

Project Title / Titre du Projet	Category / Catégorie
Marc Huot Ingénieur en chef	Phone (418) 745-2537 FAX: (418) 745-3238
Résultats des investigations géomécaniques et propriétés des matériaux de la mine Joe Mann	10
Répertoire de relevés géomécaniques et résultats d'essais en laboratoire. Orientations préférentielles, cotes géomécaniques (RQD, RMR, Q, Q'), résistance en compression, paramètres de Hoek et Brown et de Mohr-Coulomb, modules de déformation élastique, effet d'échelle. Facteurs utiles pour le calcul de la densité du boulonnage et autres applications. Références: Rapport CANMET MRL 94-026 (CL).	
Projet de triage du Minerai, Mine Joe Mann	8
Étude pour déterminer la concentration sur le site de la mine, afin de diminuer les frais de transport du tout venant (distance de 60 km) au concentration principal. (Gilles Leblanc, rapport MRL-9512, juillet 95).	
Étude du système de ventilation à la mine Meston	12,13
Faire les relevés sommaires des débits d'air frais et pertes de charges de la Mine utilisant le gaz traceur. (Recommandations sur la circuit d'aérage par George Klinowski de CANMET.)	

Ressources Meston inc.
Mine Joe Mann
Case Postale 400
Chibougamau, QC
G8P 2X8

ReMe

Project Title / Titre du Projet	Category / Catégorie
Determination of pre-mining stresses and in situ rock deformation at the Joe Mann Mine, Chibougamau, Québec	11
Détermination de la grandeur et de l'orientation des contraintes principales à l'aide de la méthode usuelle du doorstopper et celle du CSIR avec cellule triaxiale. Détermination du module de déformation du matériau en place par essais au dilatomètre. Référence: Rapport CANMET MRL 94-022 (CL).	
Rapport final du levé sismique, Mine Joe Mann	11
Déploiement de 6 sismographes portatifs pour évaluer le niveau de sismicité de la mine Joe Mann. (Recommandations et rapport de CANMET concluant).	

Ressources MSV inc.
C.P. 8000
Chibougamau, QC
G8P 2L1

ReMS

Project Title / Titre du Projet**Category /
Catégorie**

Serge Lévêque
Directeur de projet

Phone (418) 748-7691
FAX: (418) 748-7696

Essais de Boulons Résistant à la Corrosion**11**

Différents types de boulons ont été installés dans deux sites pour voir leur résistance à la corrosion. Des pointes métalliques témoins ont été placées par CANMET pour évaluer le corrosivité.

Ressources naturelles Canada
CANMET/LMSM, Mine-laboratoire
C.P. 1300 - 1, chemin Peter Ferderber
Val d'Or, QC, QC
J9P4P8

Project Title / Titre du Projet	Category / Catégorie
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Martin Côté
Project Leader

Phone (819) 736-4331
FAX: (819) 736-7251

Microseismic Activity Seismogram Database**11,13**

A database is being prepared to classify and correlate the microseismic "signatures" represented by seismograms characteristic of the failure. Signatures are subject to many variables affecting the signal including source mechanism, rock type at the source, rockmass conditions, etc. The research being conducted will systematically review the signatures from various classes of event from the many individual mines monitored by CANMET.

Ressources naturelles Canada
CANMET/LMSM, Mine-laboratoire
C.P. 1300 - 1, Chemin Peter Ferderber
Val d'Or, QC
J9P 4P8

Project Title / Titre du Projet	Category / Catégorie
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Michel Plouffe
Chef de groupe en sismologie minière

Phone (819) 736-4331
FAX: (819) 736-7251

Programme québécois de recherche sur les coups de toit

11

Le Programme québécois de recherche sur les coups de toit est une des composantes de la seconde Entente auxiliaire Canada-Québec sur le développement minéral (EADM). Le Programme comporte plusieurs volets. La recherche faite à l'interne par CANMET comprend l'installation d'un réseau sismographique dans le Nord-Ouest québécois, l'installation de systèmes de surveillance sismique dans les mines affectées par une activité sismique, une étude sur l'évaluation du risque sismique dans les mines et des levés de géotomographie pour l'évaluation de la fracturation générée par un tir de préfracturation. D'autres études sont faites en collaboration avec le gouvernement provincial, les sociétés minières et les universités. Elles portent sur la modélisation numérique tri-dimensionnelle des chantiers d'abattage remblayés, l'évaluation du potentiel de coups de terrain en fonction des effets du dynamitage de préfracturation et sur l'efficacité du remblai en pâte sur le contrôle de l'activité sismique.

Ressources naturelles Canada
CANMET/LMSM, Mine-laboratoire
C.P. 1300 - 1, Chemin Peter Ferderber
Val d'Or, QC
J9P 4P8

Project Title / Titre du Projet	Category / Catégorie
Études en sismologie minière	9,11
<p>Depuis 1991, CANMET a établi un groupe de sismologie minière à sa Mine-laboratoire de Val d'Or afin de transférer les connaissances et la technologie développées à l'interne et à travers le Programme canadien de recherche sur les coups de toit, aux mines du Québec et de l'Est du Canada. Ce projet comprend de multiples études portant sur la sismicité particulière de mines spécifiques. CANMET tente de répondre, en partenariat avec les sociétés minières, aux besoins de celles, qui sont affectées par des problèmes dus à l'activité sismique générée à leur mine. Les différents services offerts peuvent comprendre la définition des besoins, le design de levés, l'installation de systèmes de surveillance (permanents ou temporaires, centralisés ou spécifiques) conçus en fonction des besoins exprimés, le suivi des levés sismiques, l'analyse des résultats, les corrélations avec les conditions géologiques et minières, et les recommandations subséquentes. D'autres services reliés à la sismologie ou à d'autres méthodes géophysiques parents peuvent aussi être offerts, comme la géotomographie.</p>	
Étude de la sismicité dans les mines de charbon	11,13
<p>Les éruptions de roches et de gaz sont un phénomène dynamique des mines de charbon similaire aux coups de terrain car elles déplacent de larges volumes de roches dans les zones de travail; toutefois, contrairement aux coups de terrain, elles s'associent à de grandes quantités de gaz explosifs et asphyxiants sous pression. En collaboration avec le Corporation de développement du Cap-Breton et le Laboratoire de recherche sur le charbon du CANMET, une étude est en cours pour tenter de définir une signature sismique de ces éruptions lors de l'avance du front minier. L'avance du front, en diminuant la pression exercée sur la roche, peut permettre l'expansion des gaz qui se traduirait par une microfracturation du massif dont les ondes générées pourraient alors être enregistrées par un système sismique. La définition de la signature particulière de ces ondes ainsi que leur signification est en cours. Cette étude en est encore au stade préliminaire.</p>	

Ressources naturelles Canada
CANMET/LMSM, Mine-laboratoire
C.P. 1300 - 1, Chemin Peter Ferderber
Val d'Or, QC
J9P 4P8

Project Title / Titre du Projet	Category / Catégorie
<p>Marcel Laflamme, ing., Ph. D. Gestionnaire, Programme en mécanisation et automatisé</p>	<p>Phone (819) 736-4331 FAX: (819) 736-7251</p>
Inspection des machines d'extraction	9,13
Contrôler, vérifier et fournir les conseils et renseignements techniques nécessaires pour les treuils et ses composantes.	
Hydrolification des opérations minières souterraines	5,12
Développement, adaptation et implantation de technologies innovatrices dans le domaine des équipements d'extraction minière par l'utilisation de l'électro-hydro énergie en remplacement de l'énergie pneumatique.	
<p>Louise Lambert Ingénieure électrique</p>	<p>Phone (819) 736-4331 FAX: (819) 736-7251</p>
Banc d'essai pour foreuse portative à percussion	5,12
Le banc d'essai pour foreuse portative à percussion est un équipement permettant de tester les performances en mesurant les moments de force (Torque) statiques et dynamiques de celle-ci. Le but de cet équipement est d'avoir un outil pour diagnostiquer facilement et rapidement l'état d'une foreuse afin de réduire les pertes de temps et les coûts d'entretien reliés à la foreuse.	

Ressources naturelles Canada
CANMET/LMSM, Mine-laboratoire
C.P. 1300 - 1, Chemin Peter Ferderber
Val d'Or, QC
J9P 4P8

Project Title / Titre du Projet	Category / Catégorie
Development of a Production Monitoring and Reporting System for Load-Haul-Dump Operations in Underground Mines	6,12
<p>A prototype production monitoring and reporting system has been developed for load-haul-dump operations and tested at the Experimental Mine. The system generates accurate and timely information regarding mucked tonnages and draw point and ore/waste pass utilization based on RF/ID technology. Draw point control is critical in determining the cut-off point when mucking should cease in order to minimize dilution. Draw point control also ensures even draw from a stope, without which hang-up of broken ore can occur.</p>	
Développement d'un protecteur auditif à suppression de bruits dominants	6,12
<p>Le projet consiste à développer un protecteur auditif à suppression de bruits dominants, installé sur le casque du mineur, lequel permet d'atténuer le niveau de bruit capté par l'oreille humaine, tout en laissant passer les signaux sonores d'urgence ou de danger. Ce protecteur auditif permettra d'améliorer les conditions de santé et de sécurité du travailleur, tout en réduisant les risques d'accidents causés par la fatigue et le stress reliés au bruit, et de réduire les risques de développer une surdité chez le mineur.</p>	

Ressources naturelles Canada
CANMET/LMSM, Mine-laboratoire
C.P. 1300 - 1, Chemin Peter Ferderber
Val d'Or, QC
J9P 4P8

RNCa

Project Title / Titre du Projet	Category / Catégorie
Gilles LeBlanc Ingénieur mécanique	Phone (819) 736-4331 FAX: (819) 736-7251
"Cavity Monitoring System (CMS)"	9
<p>Le CMS est un appareil servant à "arpenner" de façon automatique un chantier, une ouverture ou une excavation quelconque. CANMET offre la location de l'appareil aux entreprises minières avec ou sans service de prise de données et d'analyses. Les résultats obtenus aident à évaluer, dans le cas d'un chantier, la récupération et la dilution en plus d'assister le personnel à la planification des travaux de remblai en pâte.</p>	
Recouvrement de la chaleur dans l'eau de mine (Mine water heat recovery)	2,12
<p>Étude sur les possibilités de récupération de l'énergie de l'eau de mine pour le chauffage et la climatisation des bâtiments et/ou le chauffage de l'air de la mine.</p>	
Remblai en pâte	9
<p>Analyse de la résistance en compression uniaxiale d'échantillons de remblai en pâte ou hydraulique pour différentes compagnies minières.</p>	
Projet de Boxholing	2,5
<p>Évaluation des procédures de développement de monerie tant du point de vue de la sécurité des travailleurs que la productivité. États des observations réalisés lors des essais de Machines Roger international.</p>	

Ressources naturelles Canada
CANMET/LMSM, Mine-laboratoire
C.P. 1300 - 1, Chemin Peter Ferderber
Val d'Or, QC
J9P 4P8

Project Title / Titre du Projet	Category / Catégorie
Projet de raclage automatisé	4,6
Mécanisation et automatisation du fonctionnement d'un treuil de raclage automatisé à moteur électrique et deux tambours pour utilisation dans les chantiers à faible pendage.	
Projet marteau fond de trou	5,12
Évaluation technique des marteaux hydrauliques actionnés à l'eau par rapport aux marteaux fond de trou pneumatiques. L'évaluation porte sur l'aspect de l'efficacité énergétique, des conditions d'environnement de travail et de la performance (productivité, entretien etc.).	

ROCTEST Ltd.
665 Pine
St-Lambert, QC
J4P 2P4

ROLT

Project Title / Titre du Projet	Category / Catégorie
Michel Blais Director of Research & Development	Phone (514) 465-1113 FAX: (514) 465-1938
Ruggedness Improvement of a Cable Bolt Strain Gauge	5,11
Ruggedness improvement of a cable bolt strain gauge, model Tensmeg, for Ground Control Monitoring.	
Measurement of Backfill Pressure on Bulkhead	5,11
Measurement of backfill pressure on bulkhead with improved Total Pressure Cells, models TPC-O and EPC-O.	
New 6 Point Borehole Extensometer	5,11
New 6 point Borehole Extensometer for 3" diameter borehole, with low profile vibrating wire transducers, model SAM-E/JM-T.	
Improvement in Low Cost, Rock Mass Movement Monitoring	5,11
Improvement in low cost, rock mass movement monitoring with single and dual point mechanical extensometers, models E-1 and E-2.	
Development and Design of a New Borehole Dilatometer	5,10
Development and Design of a New Borehole Dilatometer with oriented load capabilities, model PROBEX-D, for 4" diameter borehole, 0-3000 psi (20 MPa), for Rock Mechanics application.	

Smoky River Coal Limited
P.O. Box 2000
Grande Cache, AB
T0E 0Y0

SmRi

Project Title / Titre du Projet**Category /
Catégorie**

John Kulach
Chief Mining Engineer

Phone (403) 827-7088
FAX: (403) 827-7708

Long-Wall Mining Project**11**

Smoky River Coal Ltd. has decided to implement modern long-wall underground coal mining technology in Western Canadian coal deposit. Such technology has never been successfully applied in Western Canadian mountainous coal deposit. Entire project involves numerous related sub-projects such as: - \$900 000 Ground Control Project - CANMET/SRCL. - Modern long-wall equipment adaptation to varying coal seam deposition; Environmental study related to this project (project aim is to enhance production, productivity and safety of underground coal mining technology in Western Canada).

Stoother/Veco
(Bumaby/Bellingham)
2533 Beck Road
Abbotsford, BC
V2S 4S3

StVe

Project Title / Titre du Projet**Category /
Catégorie**

John R. Nurcombe
Senior Project Planner/Scheduler

Phone (360) 671-1900
FAX: (360) 676-5817

Expansion of Milne Point Facilities (25,000 bopd to 75,000 bopd)**1,4**

Planning and Scheduling (design) to expand existing wells and oil processing facilities at Milne Point, on the North slope Alaska for British Petroleum Exploration Co. Ltd. New wells and central processing facilities engineering procurement and consultation from July/94 through to Oct/96 to increase production to 75,000 bopd.

Stratmin Graphite Inc.
585 chemin du Graphite
Lac-des-Iles, QC
J0W 1J0

StGr

Project Title / Titre du Projet**Category /
Catégorie**

Didier Bezar
Vice président Recherches &
Développement

Phone (819) 597-2911
FAX: (819) 597-2410

Production de concentré de phlogopite

7

Récupérer et valoriser la phlogopite contenue dans les rejets du concentrateur de graphite.

Bas coefficient de surface

7

Séparer les paillettes de graphite minces des paillettes de graphite épaisses pour produire des concentrés de faible densité apparente.

Technical University of Nova Scotia
Dept. of Mining Engineering
P.O. Box 1000
Halifax, NS
B3J 2X4

UnNS

Project Title / Titre du Projet**Category /
Catégorie**

John D. Hill
Associate Professor

Phone (902) 420-7677
FAX: (902) 425-1037

Monitoring Ground Movement Using TDR**11,6**

Time domain reflectometry is used to monitor ground movement in pit walls and crown pillars. Laboratory and field evaluation of various cable types is ongoing to optimize signal response and minimize installation costs.

Teck-Corona Operating Corp.
David Bell Mine
Postal Bag 11
Marathon, ON
P0T 2E0

TeOp

Project Title / Titre du Projet**Category /
Catégorie**

Ken McKirdy
Senior Engineer

Phone (807) 238-1041
FAX: (807) 238-1019

East Exhaust Raise**7**

Develop exhaust raise and install fan to ventilate ore body east of shaft between 5 level and 3 level, to be in service at end of 1st quarter 1997.

East Ore Pass**6**

Develop ore/muck pass from 9 level through to 3 level (700 metres x 2.1m x 2.1m) to service ore body east of the shaft between 5 level and 3 level, to be in service for 1997.

The Laser Institute
9924 - 45 Avenue
Edmonton, AB
T6E 5J1

ThLa

Project Title / Titre du Projet**Category /
Catégorie**

**Dr. V.E. (Vivian)
Merchant**

Phone (403) 436-9750

Program Director, Materials Processing

FAX: (403) 437-1240

Development on Laser Surface Modification Technology**5**

Laser cladding is used to deposit wear or corrosion-resistant coatings with low dilution, under low heat input conditions, which minimizes distortion of the substrate. Hence, it is suitable for critical components such as parts of pumps and valves. At The Laser Institute (TLI), weld overlays of stellite, rustelle, nickel aluminium bronze, delchrome (chrome carbide in iron base), and steel have been produced, using either a powder or wire feed. The coating properties, microstructure hardness, and in some cases, abrasive wear rate have been compared to the laser processing conditions.

Three-D Geoconsultants Ltd.
P.O. Box 3133, Station B
731 Brunswick Street, Suite 1
Fredericton, NB
E3A 2H3

ThGe

Project Title / Titre du Projet	Category / Catégorie
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Donald E. Gemmell
President, Senior Geologist

Phone (806) 453-7700
FAX: (806) 453-9861

Geoscience Projects**3,9**

Projects have been completed in all spheres of the earth sciences utilizing various drilling methods, geophysical surveys (including downhole logging), geochemical surveys, computer assisted data analysis including GIS technology and remote sensing. Commodities focused on include coal, oil and gas, oil shale, surficial materials, industrial minerals, including assessments of peat and peatlands, as well as aggregate and dimensional stone evaluations and hydrogeological studies.

Université de Sherbrooke
2500, Boul. Université
Sherbrooke, QC
J1K 2R1

Project Title / Titre du Projet		Category / Catégorie
Gérard Ballivy/ Marco Quirion		
Phone (819) 821-7115		
FAX: (819) 821-7974		
Application of Fiber Optic Sensors for Monitoring Stain Variations in Rock Masses and in Civil Engineering Structures		10,11
Fiber optic sensors are currently receiving much attention for use by the construction industry in general. Our research project is oriented on the development of a small concrete inclusion with fiber optic sensors in it. This concrete inclusion can be installed and grouted in rock masses or dams to monitored stress and strain variations.		
Carmel Jolicoeur		
Professeur		
Phone (819) 821-7565		
FAX: (819) 821-7939		
Densification des boues de résidus miniers pour le remblayage hydraulique de chantiers souterrains		11
Les objectifs visés dans ce projet sont: 1- Développement de systèmes de remblayage hydraulique à haute densité visant à minimiser la décharge de résidus miniers dans l'environnement; 2- Développement des connaissances nécessaires pour ces systèmes et assister leur implantation industrielle à la mine Kiena.		

Université de Sherbrooke
Génie électrique et génie informatique
Faculté des sciences appliquées
Sherbrooke, QC
J1K 2R1

Project Title / Titre du Projet	Category / Catégorie
Bruno Paillard Professeur	Phone (819) 821-7138 FAX: (819) 821-7937
Casque anti-bruit "ouvert"	4
L'objectif de ce projet est de développer un casque anti-bruit de configuration "ouverte" permettant d'annuler les bruits indésirables, tout en restant absolument transparent aux signaux utiles (conversations/signaux avertisseurs de danger). L'atténuation du casque devrait être importante (20-30 dB) sur une large bande de fréquence (50 Hz - 15 kHz) et le casque devrait être ouvert et léger à porter (de type "baladeur").	
Noureddine Atalla Rémy Oddo Professeur et assistant de recherche	Phone (819) 821-7157 FAX: (819) 821-7163
Étude de faisabilité des moyens de contrôle du bruit des tiges de foreuse à percussion	2,13
Étude théorique et expérimentale des moyens de réduction de bruit des tiges de foreuse comprenant: 1- Analyse numérique du comportement vibroacoustique des tiges de foreus; 2- Tests en laboratoire des solutions proposées, puis essais sur le terrain; 3- Développement d'un prototype d'une tige silencieuse.	

Université Laval
Département de mines et métallurgie
Sainte-Foy, QC
G1K 7P4

Project Title / Titre du Projet	Category / Catégorie
John Hadjigeorgiou Professeur	Phone (418) 656-2554 FAX: (418) 656-5343
Predicting Joint Behaviour Using Artificial Neural Networks	10,12
The behaviour of natural rock joints is investigated, both in the laboratory and in the field. Artificial Neural Networks are used to characterize joint roughness and the complete shear-deformation curves.	
Co-mingling Waste Disposal Method	3
Co-mingling mine waste with mill produced tailings has the potential for controlling the generation of Acid Rock Drainage. The influence of stratified waste rock placement with dewatered tailings has been investigated in a series of controlled column tests. The development methodology, monitoring results and long-term implications of co-mingling is part of our integrated mine waste management program.	
Conception de stratégies pour le soutènement des excavations minières souterraines dans les massifs rocheux fracturés	11
Ce projet vise principalement à améliorer les méthodes d'élaboration des stratégies de soutènement des excavations souterraines.	
Multimedia Training Modules for Ground Control	11
This is a continuing area of work. A multimedia prototype has already been developed for rock bolting. This incorporates sound, images, video and animation.	

Université Laval
Département de mines et métallurgie
Sainte-Foy, QC
G1K 7P4

Project Title / Titre du Projet**Category /
Catégorie**

Characterizing Discontinuous Rock Masses for Engineering Purposes 10,11

This project advances the theory of block size distribution as a practical method to characterize the rock mass. Backed by field trials investigated applications include: blast design, stability analysis, and reinforcement design.

Jacek Parasczak
Professeur

Phone (418) 656-5103
FAX: (418) 656-5343

Détermination du potentiel de l'éclatage en tant qu'une technologie d'abattage des roches dures sans explosif 5

L'objectif principal de ce projet est d'évaluer le potentiel de la technologie d'éclatage en tant qu'une méthode d'abattage des roches dures sans explosif. Les diverses conceptions des éclateurs sont étudiées et évaluées en vue de leur application dans les mines souterraines, surtout celle situées dans la province de Québec. Plus spécifiquement, on a donc: 1- Évalué la technologie d'éclatage existante (théorie et principe, état des connaissances); 2- Identifié un éclateur approprié aux opérations minières et évalué son potentiel; 3- Étudié la performance de l'éclateur dans un environnement contrôlé (laboratoire) ainsi que sur le terrain. Des blocs de béton et, par la suite, des blocs de roches furent utilisés pour tester un prototype d'éclateur à action axiale-radiale.

Université Laval
Département de Mines & Métallurgie
Sainte-Foy, QC
G1K 7P4

UnLa

Project Title / Titre du Projet**Category /
Catégorie**

Dr. Stefan Planeta
Professeur

Phone (418) 656-2555
FAX: (418) 656-5343

Étude sur la diminution des rejets miniers par la séparation du minerai

8

L'objectif principal de ce projet est le développement d'une méthode permettant de séparer le minerai en milieu dense dans les mines existantes et les nouvelles mines. Il se divise en quatre phases: 1- Essais en laboratoire de séparation en milieu dense; 2- Essais sur les produits issus de la pré-concentration; 3- Étude de faisabilité de la pré-concentration en souterrain et à la surface; 4- Étude d'applicabilité de la pré-concentration du minerai aux mines actuelles et nouvelles.

Daniel Hodouin
Professeur

Phone (418) 656-5003
FAX: (418) 656-5343

L'automatique avancée pour les usines minéralurgiques et métallurgiques

12

Le projet vise à développer des méthodes de traitement de l'information en temps réel pour l'automatisation et l'optimisation des usines de traitement de minerais et de métallurgie extractive. Le projet est financé par un consortium de 14 compagnies minières canadiennes et par les ministères des ressources naturelles du Canada et du Québec.

University of Alberta
606 Chemical/Mineral Engineering Bldg.
Edmonton, AB
T6G 2G6

UnAB

Project Title / Titre du Projet	Category / Catégorie
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K. Barron
Professor of Mining Engineering

Phone (403) 492-2867
FAX: (403) 492-3409

"Cutter Roof" Failure

11

Cutter roof failure is a common mode of failure in North American coal mines; a failure plane is initiated at the roof-rib intersection and propagates at a steep angle to the horizontal, eventually it reaches a weak zone of rock or a weak bedding plane, whereupon collapse occurs. Proposed theories on the causes of cutter roof failure are conflicting and incomplete. A limit equilibrium approach has been taken to this problem and a new theory has been developed to analyze the roof stability for this failure mode. This theory is being programmed for computer analysis, and a number of case study scenarios are being examined to identify the prime variables affecting this phenomenon. In addition, the roof support necessary to prevent failure can be determined. It is planned to develop design guidelines, based on a knowledge of the in situ stress conditions and the CSIR roof rock mass rating, to assist engineers in specifying the support requirements.

University of Alberta
606 Chemical/Mineral Engineering Bldg.
Edmonton, AB
T6G 2G6

UnAB

Project Title / Titre du Projet	Category / Catégorie
Arching Action in Underground Mining	11
<p>An important concept in underground mine design is that of "arching action", whereby most of the ground load above an excavation is transferred to the abutments. It is also this action which allows the rocks in the immediate roof to span the opening. In bedded rocks, theories of the "Voussoir beam" or "Linear arch" have been advanced to explain and quantify the arching behaviours of the immediate roof. Despite a significant amount of previous work in developing linear arch theory, a number of questions continue to exist with respect to the assumptions made in these theories which have lead to incompatibilities between experimental and theoretical results. A more general analysis procedure is therefore being developed in an endeavour to resolve these incompatibilities. In addition, it should be possible to tackle this problem via finite element modeling. Results from the revised theory and from finite element models will then be compared with experimental results reported in the literature.</p>	
Buckling Failure in Bedded Footwall Slopes	11
<p>Potential modes of failure in bedded footwall slopes include plane shear failure, bi-linear slab failure, ploughing failure and buckling failure. Methods to analyze footwall stability in each of these cases have been developed. However, in the case of buckling failure the "Euler" buckling analysis does not fit observed field behaviours. Cavers "hinge buckling" approach is much better, but is still not totally compatible with field observations. It is believed that an improved buckling analysis can be developed by considering the buckling strata as a "Voussoir beam". It is proposed to extend the voussoir beam analysis and to consider the case of footwall buckling. Verification will then be attempted via comparison of this revised theory with field results.</p>	

University of British Columbia
Dept. of Mining and Mineral/Process Engineering
517-6305 Stores Road
Vancouver, BC
V6T 1Z4

Project Title / Titre du Projet	Category / Catégorie
Dr. George W. Poling Professor	Phone (604) 822-3981 FAX: (604) 822-5599
Submarine Tailing Disposal	3
An evaluation of submarine disposal technologies practiced in Canada and around the world. Environmental impacts, monitored and assessed, impacts evaluated. Criteria for suitable tailing materials and submarine environments are proposed.	
Physical and Colloidal Properties of Kimberlite Colloidal Clays	3
Specimens of kimberlite from the BHP - NWT diamond project are being evaluated for physical sedimentation, clarification and geochemical characteristics in water.	
Pyrite Weathering in the Generation of Acid Rock Drainage	3
Pyrite-containing rock samples from the Mount Milligan and Eskay Creek ore bodies have been evaluated for pyrite weathering rates which were previously reported to differ widely. Lithological and mineralogical differences.	
Monitoring Acid Rock Drainage in Mine Waste Dumps	3
Land dumps at BHP's Island Cooper Mine are being monitored for contaminated seeps. Following excavation of one waste dump rehabilitation of ground water on and around the foot-print is being monitored.	

University of British Columbia
Mining & Mineral Process Engr.
6350 Stores Road, Room 5170
Vancouver, BC
V6T 1Z4

Project Title / Titre du Projet	Category / Catégorie
Rimas Pakalnis Assistant Professor	Phone (640) 822-3988 FAX: (604) 822-5599
Empirical Calibration of Modified Stability Graph	11
Project to plot onto "stability graph" for open stope design the amount of wall slouch as measured by cavity monitoring surveys (industrial partner: Detour Lake Mine).	
Design of Sill Mats	11
Research program in association with Snip Mine/B.C. to design a sill mat, implement and monitor its behaviour for purpose of identifying loading and strength conditions.	
Geometric Assessment for Empirical Design	11
Modifications to the hydraulic radius term are made to better account for irregular stope geometry in the design of mine openings. The radius factor term is introduced. (Industrial Partner: Noranda).	
Prediction of Roof Cave for Underground Coal Mines	11
Field and analytical studies performed at Quinsam Coal Mine for the prediction of roof collapse for this a room pillar coal operation with subsequent pillar extraction.	

University of British Columbia
Mining & Mineral Process Engr.
6350 Stores Road, Room 5170
Vancouver, BC
V6T 1Z4

UnBC

Project Title / Titre du Projet	Category / Catégorie
Design Guidelines for the Design of Narrow Open Stopes 4	11
Project to develop guidelines for the design of narrow (2 m width) stopes for purposes of minimizing dilution. Stopes are surveyed/monitored in terms of wall slouch, blast damage, drill hole deviation, vibration monitoring.	

University of Saskatchewan
Department of Geological Sciences
114 Science Place
Saskatoon, SK
S7N 5E2

UnSK

Project Title / Titre du Projet**Category /
Catégorie**

Rob Kerrich
Professor Geological Sciences

Phone (306) 966-5719
FAX: (306) 966-8593

Volcanic Belt Prospectivity for VMS**12**

Application of high precision low level multi-element analyses by ICP MS to characterize the geodynamic setting of volcanic belts for assessing their prospectivity for VMS deposits.

University of Saskatchewan
Dept. of Geological Sciences
114 Sience Place
Saskatoon, SK
S7N 5E2

Project Title / Titre du Projet	Category / Catégorie
Doug Stead Professor	Phone (306) 966-5714 FAX: (306) 966-8593
Acoustic Characterization of Salt Rocks	10,11
Acoustic emission and acoustic velocity/attervation are being used in the characterization of helite and potash under varied stress conditions both in the field and the laboratory data is being stored in an ongoing Saltdata database containing published information on the physical and mechanical properties of salt rocks.	
The Application of G.I.S. to Rock Engineering	10,11
The use of geographic information systems in underground and surface rock engineering design is being explored with reference to Western Canadian Mines.	
Acoustic Emission during Brittle Fracture of Lac Du Bonnet Granite/Granodiorite	10,11
Acoustic emission combined with strain measurements is being used to investigate crack initiation and propagation in stressed laboratory samples of granite/granodiorite from the A.E.C.L. Ltd. Underground Research Laboratory, Pimawa, Manitoba. Particle flow code models are under development to simulate laboratory brittle fracture results.	
Distinct Element Modelling of Surface Mine Slopes	4,11
Distinct element modeling is being used to investigate deformation mechanisms occurring during the failure of surface mine stopes, in particular toppling and footwall failure modes have been examined. The influence of underground workings on stope stability is also being studied.	

Western Research Centre
P.O. Bag 1280
Devon, AB
T0C 1E0

WeRe

Project Title / Titre du Projet**Category /
Catégorie**

D.B. Stewart
Director, Western Research Centre

Phone (403) 987-8614
FAX: (403) 987-8690

Rock Drain Research Program**3**

A 5-year field investigation of the geotechnical and environmental performance of a large cross valley rock drain at a surface coal mine in the mountains of south eastern British Columbia.

Westmin Resources Limited
Myra Falls Operations
P.O. Box 8000
Campbell River, BC
V9W 5E2

WeLt

Project Title / Titre du Projet	Category / Catégorie
Enrique A. Isagon Sr. Project Engineer	Phone (604) 287-9271 FAX: (604) 287-7123
Paste Backfill System Modification and Stope Placement Test Project	4
<p>The final mill tails will be fluidized using CANMET fluidization technology, by converting one of the hydraulic backfill holding tank into a fluidization tank. The prepared slurry, with a density of 70% - 80% will be discharged into a mixer where cement will be added, and fed into backfill lines leading to underground stopes. Flow characteristics will be monitored.</p>	

YUTECHnologies
400 Webb Drive
Suite 2109
Mississauga, ON
L5B 3Z7

YUTE

Project Title / Titre du Projet	Category / Catégorie
T.R. (Sean) Yu, Ph. D., P. Eng President	Phone (905) 270-6389 FAX: (905) 270-0756
Development of New Damage Criteria for Rock Blasting	11
A set of new blast damage criteria has been developed for assessing damage by incorporating the vibration level, rock properties, site characteristics and the effects of ground support systems. The new damage criteria will allow one to estimate the degree of damage to rock structure in underground or open pit blasting.	
Technical Book Writing on "Consolidated Rockfill"	9
Based on many years of involvement with rockfill research and practices, the writer is preparing this monograph intending to serve as reference materials for practicing mining engineers, civil engineers, as well as university students in mastering the subject.	



SECTION 2

**PROJECTS LISTED BY CATEGORY/
PROJETS LISTÉS PAR CATÉGORIE**

1. Administration

Project Title / Titre du Projet	Code
Development of Team Concept	HbMs
Expansion of Milne Point Facilities (25,000 bopd to 75,000 bopd)	StVe
Infrastructure Development	INLt

2. Feasibility

Project Title / Titre du Projet	Code
Coalbed Methane Research Canada	GeSu
Enhancing Natural Degradation Gold Mill Effluent using pH Adjustment and Conversion of Effluent to Snow	BaGo
Étude de faisabilité des moyens de contrôle du bruit des tiges de foreuse à percussion	UnSh
Étude de pré-faisabilité pour l'expansion vers les niveaux inférieurs	Lami
Intelligent Vision Sensor	INLt
Luce Deposit Feasibility Study	IrOr
Optimization of Mine Ventilation Circuits	NRCa
Paste Fill Slurry	NoMi
Projet de Boxholing	RNCa
Projet Vezze	AgEa
Recouvrement de la chaleur dans l'eau de mine (Mine water heat recovery)	RNCa
Slaking Characteristics and Neutralization Capacity of Lime at Dymond Clay Products Limited	MiMi
The True Value of Mine in a Developing Country	ÉcPo

3. Surface Technology

Project Title / Titre du Projet	Code
Analysis of Saskatchewan Uranium Mines Environmental Data	AeCb
Application of Geographic Information Systems (GIS) to Visualization and Interpretation of Mining Effluent Impacts on a Regional Watershed	MnDm
Borehole Geophysical Studies of the Hemlo Deposit	MiNo
Burial of Industrial Plants	ÉcPo
CBM Content of Coals from the Tsable River Area Vancouver Island, B.C.	MiEm
Co-mingling Waste Disposal Method	UnLa
Coal Quality Variation on the Sething Formation NE, B.C.	MiEm
Collection, Cataloguing and Analysis of Ontario Inactive Mine Data	MiNo
Cover Technology for the Reclamation of Acidic Tailings Pond	ÉcPo
Dispersion of Trace and Other Elements into the Environment as a Result of Coal Combustion	GeSu
Environmental Monitoring of Uranium Mining Waste Using Geophysical Techniques - Phase II	AeCb
Geographic Information Systems (GIS)	HiVa
Geoscience Projects	ThGe
Global Positioning System (GPS) for Shovels	HiVa
Global Positioning System Application (G.P.S.)	IrOr
Global Positioning Systems for Drills	HiVa

GPS Applications in Mining	FoCo
Green Industrial Heat Recovery Retrofit at Williams Operating Corporation	OnMi
Localisation des camions par GPS	LaCh
Minfile (B.C. Mineral Inventory)	MiEm
Monitoring Acid Rock Drainage in Mine Waste Dumps	UnBC
Multi-Media Geochemical Sampling in Areas of Thick Overburden: A Case Study	MiNo
Open Pit Optimized Long-Term Scheduling	PIIn
Passivation of Pyrite Oxidation by Natural Products	LaUn
Phosphorus Distribution in Mist Mountain Formation	MiEm
Physical and Colloidal Properties of Kimberlite Colloidal Clays	UnBC
Physical Chemistry of Cementation Mechanism of Mineral Fines	LaUn
Prevention of AMD by Tailings Agglomeration	LaUn
Pyrite Weathering in the Generation of Acid Rock Drainage	UnBC
Rehabilitation Sand Pit	AlSt
Remote Vital Signo Monitoring of Mining Equipment	IrOr
Research and Development of Forward Modelling, Inversion and Imaging Tools for Electromagnetic Methods	MiNo
Restauration de sites minier	CaIn
Rock Drain Research Program	WeRe

Submarine Tailing Disposal	UnBC
Sulphur Distribution in a Coal Seam from the Telkwa Property, Northwest B.C.	MiEm
Use of Tracers to Locate Gold Lock-Up in Mills	NeEr
Utilisation de la réflectométrie en domaine temporel (RDT) pour la surveillance des pentes de mine à ciel ouvert	LaCh
Viscoplastic Modelling of Rock Salt	ÉcPo
Waste Water Treatment Plant	CBDe

4. Design

Project Title / Titre du Projet	Code
3D-CANVENT - A User-friendly Mine Ventilation Simulator	NRCa
Casque anti-bruit "ouvert"	UnSh
Cerro Verde Project	FIDa
Computer-based Inventory of Economics, Quality, Contaminants and Land use Issues of Canada's Coal Resources (National Coal Inventory)	GeSu
Design de piliers en prévision de l'expansion de la mine	Lami
Development of Design Guidelines for Narrow Vein Mining in Terms of Minimizing Dilution	EcBa
Development of Predictive Blasting Model Using DDA	QuUn
Distinct Element Modelling of Surface Mine Slopes	UnSK
Engineering Design for a Ferric Chloride Leaching Plant	NeGu
Étude sur la capacité du treuil et du chevalement	Lami
Geotechnical Design of Pillars	QuCo
Mine Ventilation Automation - MIC-L Expert System	NRCa
Mine Ventilation Automation - Ventilation on Demand	NRCa
Mine Ventilation Control	NRCa
Multiple Automatic Haulage Trucks c/w Traffic Control	MiSy
Optimization of Underground Layout and Design	MiCu

Paste Backfill System Modification and Stope Placement Test Project	WeLt
Projet de raclage automatisé	RNCa
Stress and Deformation Analysis of Tailings Dams	McUn
Technology Development for Geological Modelling, Resource Analysis and Remote Sensing (National Coal Inventory)	GeSu
Ventilation and Air Analysis	NRCa

5. Equipment

Project Title / Titre du Projet	Code
Banc d'essai pour foreuse portative à percussion	RNCa
Booster Compressors for High Pressure Drilling	NaCo
Détermination du potentiel de l'éclatage en tant qu'une technologie d'abattage des roches dures sans explosif	UnLa
Development and Design of a New Borehole Dilatometer	ROLt
Development on Laser Surface Modification Technology	ThLa
Développement de câbles miniers hautes performances	Inde
Drill Automation	QuOp
Electron Service Monitoring Systems	DuMa
Foreuse V-30 et mât	MaRo
Guided Drill System	INLt
High Speed u/g Articulated Teledump and End Dump Trucks with Detroit Diesel DDEC Electronically Controlled Engine	DuMa
Hydrolification des opérations minières souterraines	RNCa
Improvement in Low Cost, Rock Mass Movement Monitoring	ROLt
Large Diameter Percussion Drilling (Uphole and Downhole)	NaCo
Measurement of Backfill Pressure on Bulkhead	ROLt
Mine Ventilation Based on Air Quality	NRCa

Multi-purpose Cassette Porter (Prime Mover) Mine Transport System	DuMa
New 6 Point Borehole Extensometer	ROLt
New Type of Backfill Haul Truck with Leakproof Hydraulically Controlled Tailgate	DuMa
Projet marteau fond de trou	RNCa
Rail Bound Electric/Hydraulic Powered 1/2 cu.yd. Capacity Decline Mucking Machine	DuMa
Remote Controlled Lift Platforms	DuMa
Road Router	INLt
Ruggedness Improvement of a Cable Bolt Strain Gauge	ROLt
Shotcrete Mechanization	NoMi
Sound and Miscellaneous Emissions During Rock Fracture	LaUn
Underground Diesel Emissions Monitoring	NoMi
Underground Haulage Truck Automation	INLt

6. Development

Project Title / Titre du Projet	Code
Amélioration de la qualité de l'eau recirculée à partir du bassin de rejets	Lami
Arpentage des chantiers au laser (CMS)	Lami
Block to Mine Development	HeGo
Bonification du concentré de magnétite	Lami
Booster Ventilation Fan	CBDe
Development in Unconsolidated Fill	NoMi
Development of a Production Monitoring and Reporting System for Load-Haul-Dump Operations in Underground Mines	RNCa
Development of Cold Bond Tailings Agglomeration (CBTA) Technology	LaUn
Development of Empirical Design Techniques in Burst Prone Ground at A.W. White Mine	PIDo
Development of Total Tailings Paste Fill Using Tailings Agglomerates as Aggregate	LaUn
Development under Backfill	HeGo
Développement d'un protecteur auditif à suppression de bruits dominants	RNCa
East Ore Pass	TeOp
Haulage Extension	CBDe
Miroc Mineguard Spray-On-Liner	BaGo
Ore Pass Enlargement Study	INLt

Production de la soude caustique à partir des poussière récupérées lors des fusions	Lami
Promotion and Development of B.C. Dimension Stone and Refractory Minerals	BCTr
Récupération de l'apatite à partir des rejets du concentrateur	Lami
Récupération du niobium réfractaire à partir des rejets de flottation	Lami
Scrap Removal from Ore Flow	INLt
Shovel Monitor	IrOr
SIGÉOM - Système d'information géominière du Québec	MiRe
Slotted Perimeter Technology	INLt
Trout Lake Mine Deepening Project	HbMs
Usine-Pilote pour le traitement des minerais oxydés	NoIn

7. Production

Project Title / Titre du Projet	Code
Bas coefficient de surface	StGr
Bulk Emulsion Explosive	HeGo
Cavity Monitoring System	HeGo
Characterization of Excavation-induced Rockmass Damage	McUn
Chargement d'explosifs en vrac	Lami
Cleaner Circuit Upgrade	PlDo
Development of an Expert System Scheduling Module	FaLt
Dilution Analysis	NoMi
East Exhaust Raise	TeOp
High Density Paste Fill	KiGo
Optimization of Raise Borer Performance	McUn
Ore Body Modeling	NoMi
Ore Pass Hang-up Removal	INLt
Orebody Delineation Influence on Mining Performance	McUn
Production de concentré de phlogopite	StGr
Projet d'injection des concentrés du cuivre	NoIn
Sand Control (in oil wells)	AlRe

Silver Recovery from Zinc Rich Ores

BiMe

Survey Analysis and Mapping

NoMi

Systems Safety in Underground Mining Automation

McUn

Usine de flottation

CaIn

8. Materials Handling

Project Title / Titre du Projet	Code
Étude sur la diminution des rejets miniers par la séparation du minerai	UnLa
Materials Handling Study	IrOr
Mine Paste Backfill Design	GoAs
Pastefill System	HeGo
Projet de triage du Minerai, Mine Joe Mann	ReMe
Shotcrete Mechanization	NoMi

9. Services

Project Title / Titre du Projet	Code
"Cavity Monitoring System (CMS)"	RNCa
Assessment Report Indexing System (ARIS)	BCGe
Études en séismologie minière	RNCa
Inspection des machines d'extraction	RNCa
Maintenance Communication	INLt
Mining Environment Database	LaUn
Pen Computer Data Collection for Ramp Tests	INLt
Remblai en pâte	RNCa
Simulation Studies	INLt
Technical Book Writing on "Consolidated Rockfill"	YUTE

10. Ground Control

Project Title / Titre du Projet	Code
Acoustic Characterization of Salt Rocks	UnSK
Acoustic Emission during Brittle Fracture of Lac Du Bonnet Granite/Granodiorite	UnSK
Application of Fiber Optic Sensors for Monitoring Strain Variations in Rock Masses and in Civil Engineering Structures	UnSh
Backfill Monitoring	NoMi
Blast Damage Assessment - Kidd Creek No. 3 Mine	FaLt
Caractérisation et instrumentation du pilier horizontal	Lami
Characterizing Discontinuous Rock Masses for Engineering Purposes	UnLa
Creep Testing of Weak Rocks	NRCa
Database on In Situ Stress Values	NRCa
Deep Dewatering/Piezometer Holes for Slope Stability	HiVa
Guide pour la prédiction de la fracturation dans les carrières de pierre de taille	INRS
Levé sismique	Lami
Predicting Joint Behaviour Using Artificial Neural Networks	UnLa
Résultats des investigations géomécaniques et propriétés des matériaux de la mine Joe Mann	ReMe
The Application of G.I.S. to Rock Engineering	UnSK

11. High Tech

Project Title / Titre du Projet	Code
"Cutter Roof" Failure	UnAB
"Quantitative Evaluation of Pastefill Performance to Alleviate Rockburst at Chimo Mine"	CaIn
Application of Composite Bolts in Potash Mining Excavations	PoCo
Arching Action in Underground Mining	UnAB
Backfill Plug Design	INLt
Blast Damage Control in Underground Mines	LaUn
Blasting Overpressure, Prediction and Control	INLt
Boltless Shotcrete Trial	INLt
Buckling Failure in Bedded Footwall Slopes	UnAB
Collecte et analyse des événements séismiques à la mine Chimo	CaIn
Conception de stratégies pour le soutènement des excavations minières souterraines dans les massif rocheux fracturés	UnLa
Consolidation of Mine Backfill using Partial Portland Cement Replacement by Ground Landall Waste Glass	QuUn
Continuous Damage Mechanics for Rocks and Rock Masses	ÉcPo
Contrôle des risques de coups de terrain par tirs de relaxation	IRSS
Densification des boues de résidus miniers pour le remblayage hydraulique de chantiers souterrains	UnSh
Design Guidelines for the Design of Narrow Open Stopes 4	UnBC

Design of Sill Mats	UnBC
Determination of pre-mining stresses and in situ rock deformation at the Joe Mann Mine, Chibougamau, Québec	ReMe
Development of a Large 3D Numerical Model	NRCa
Development of Block Spring Model	NRCa
Development of Design Guidelines for Narrow Vein Captive Open Stope Mining	PIDo
Development of New Damage Criteria for Rock Blasting	YUTE
Development of Prototype Novel Instrumented Cable Bolt	QuUn
Développement d'un logiciel de formation sur les systèmes de boulonnage	IRSS
Drill Monitor	IrOr
Effect of Destressing on Rockburst Potential in a Hard Rock Mine	ÉcPo
Élaboration d'un modèle de prédiction des contraintes in situ dans le nord-ouest Québécois	IRSS
Empirical Calibration of Modified Stability Graph	UnBC
Essais de Boulons Résistant à la Corrosion	ReMS
Étude de la sismicité dans les mines de charbon	RNCa
Étude du potentiel de coup de terrain dans les mines: Phase 2: validation de la méthodologie	IRSS
Évaluation de la marge de sécurité caractérisant certains piliers de surface des mines souterraines du Bouclier canadien	IRSS
Évaluation du potentiel de coups de terrain dans les mines Phase 3: élaboration d'un guide technique d'application de la méthodologie	IRSS

Evaluation of Mine Induced Stress Change on Cable Bolt Support	QuUn
Evaluation of Rockburst Potential in Hard Rock Mines	ÉcPo
Expert System for Sill Pillar Recovery Strategies	NRCa
Geometric Assessment for Empirical Design	UnBC
Ground Stability Assessment for Very - Large-scaled Mine (Rock) Structures using Three Dimension Finite Element Method	NRCa
Ground Support Design	INLt
Ground Support for Bursting Conditions	NoMi
Guide de design des barricades de mine pour le remblai	IRSS
In Situ Stress Measurements	BaGo
Influence of Groundwater on Stability of Rock Mass Structures	McUn
Instrumentation Development	NRCa
Integrated - Seismic - Stress - Geomechanical Design	QuUn
Joint Collaborative Mining/Research	NRCa
Long-Wall Mining Project	SmRi
Longwall Research Program	NRCa
Micro-Seismic Monitoring in a Surface Borehole	AgIn
Microseismic Activity Seismogram Database	RNCa
Mineguard Implementation	INLt
Miroc Microseismic Monitoring	BaGo

Modélisation numérique tri-dimensionnelle des chantiers d'abattage remblayés	McUn
Monitoring Ground Movement Using TDR	UnNS
Multimedia Training Modules for Ground Control	UnLa
Nouvelle technologie d'instrumentation des câbles d'ancrage cimentés pour le contrôle de la sécurité dans les exploitations minières	IRSS
Numerical Model Evaluation of Influence of Change in Mine Stiffness on Rockburst Hazard	QuUn
Numerical Simulation of Groundwater Flow in Fractured Rock Masses	McUn
Optimization of Cable Bolt Reinforcement for Underground	INLt
Optimization of Cable Bolt Support	QuUn
Optimization of Mine Design	NRCa
Ore Pass Lining Projects	FaLt
Post Pillar and Abutment Monitoring	INLt
Prediction of Roof Cave for Underground Coal Mines	UnBC
Programme québécois de recherche sur les coups de toit	RNCa
Rapport final du levé sismique, Mine Joe Mann	ReMe
Resin Anchor - 6 feet of Cable Bolts - Wet Holes	HbMs
Rockburst Control Using Destress Blasting	McUn
Rockburst Risk Analysis (RRA)	NoMi
Rockburst Simulation Modelling (MAP3D)	INLt

Self-Organized Critical Seismicity Model	INL _t
Shaft Stability of No. 6 Shaft, MSV Ressources Inc. Chibougamau, Québec	NRCa
Soutènement des excavations minières souterraines	IRSS
Spatial and Temporal Seismic Analysis, Phase 2	INL _t
Stabilité des piliers de mines à l'aide du cylindre instrumenté de l'Université de Sherbrooke	IRSS
Stabilité des piliers de mines à l'aide du cylindre instrumenté de l'Université de Sherbrooke	IRSS
Stability of Large Salt Stopes	PoCo
Stochastic Analysis of Creighton Micro-Data	INL _t
Surface Subsidence Monitoring at Potacan Mining Co.	PoMi
Testing and Modeling Paste Backfill	QuUn
Time Dependent Modelling of Backfilled Stopes with Bolts in Soft Rock Mines	McUn
Tir de relaxation (1995-96)	PIDo
Whole Waveform Research	INL _t

12. Processing

Project Title / Titre du Projet	Code
"DataTrap" Design and Production	MiRe
3-D Simulation of Stopping Methods and Equipment Systems for Automated Underground Hard Rock Mining (NSERC 1995-97)	LaUn
Computer Software for Mine Rescue Training	NRCa
Computerized Ore Blending System	IrOr
Développement d'un analyseur portatif d'or	CeRe
Drill GPS - Open Pit	FoCo
Drill Monitoring - Open Pit	FoCo
Étude du système de ventilation à la mine Meston	ReMe
Geochemistry and Mineralogy of Indium and other Metals	NoMi
GPS Survey	FoCo
Integrated Seismic System Expansion	NoMi
L'automatique avancée pour les usines minéralurgiques et métallurgiques	UnLa
Lynx Geoscience Modelling System and microLynx+	LyGe
Mine Planning Systems Integration	IrOr
Mineral Potential Assessment/Land Use Planning/Environmental Assessment	LaUn
Mining Automation Program (MAP)	INLt
Neural Network Vibration Analysis	IrOr

Opti-Trak Truck Haulage	HbMs
Shovel GPS - Open Pit	FoCo
Simulation for Design of Automated Mining Systems	McUn
The Final Contours of Underground Mines	ÉcPo
Volcanic Belt Prospectivity for VMS	UnSK

13. Health and Safety

Project Title / Titre du Projet	Code
A Case-Control Study of Beaverlodge Uranium Miners from 1950-1980	AeCb
Ambient Diesel Emissions Instrumentation Development and Assessment	NRCa
Analysis of Saskatchewan Uranium Mines Environmental Data	AeCb
Analysis of Uranium Mine Workers Exposure Data	AeCb
Analysis of Uranium Mine Workers Exposure Data	AeCb
Blast-Induced Dust	LaUn
Diesel Emissions Reduction Device R&D and Performance Assessments of Fuel and Emissions Reduction Devices	NRCa
Diesel Engine Emissions Assessments for Mining Equipment Certification and General R/D Purposes	NRCa
Dietary Survey of Hatchet Lake Band	AeCb
Étude du potentiel de coups de terrain à la mine Sigma en relation avec les effets du dynamitage de préfracturation	ÉcPo
Groundwater Inflow Into Deep Underground Mines - Phase III	AeCb
Inactive Mines Project	NRCa
Lung Cancer Among Uranium Miners in Germany	AeCb
Mine Fire Gas Analysis Transportable Unit	NRCa
Mine Ventilation by Demands: Totally Controlled Ventilation Circuits - Volumes and Quality Monitoring Instrumentation	NoMi
Ontario Miners Mortality Study - Phase 5	AeCb

Physical Characteristics and Solubility of Long-Lived Airborne Particulates in Uranium Producing and Manufacturing Facilities	AeCb
Protection contre les chutes de hauteur	IRSS
Radiological Impact of Uranium Mining: Ontario - Phase 2	AeCb
Shaft Station Doors in Underground	ONLa
Study of the Health Effects of Inhaled Uranium Ore Dust - Phase 3	AeCb
Sulphide Dust Explosions	LaUn
Wire-rope Testing Instrument - Computerization	NRCa

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**LIST OF PARTICIPATING ORGANIZATIONS/
LISTE DES ORGANISATIONS PARTICIPANTES**

INDUSTRY/INDUSTRIE**Alberta/Alberta**

Smoky River Coal Limited	SmRi
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British Columbia/Colombie-Britannique

B.C. Trade & Investment Office	BCTr
Fluor Daniel Wright	FlDa
Fording Coal Limited	FoCo
Highland Valley Copper	HiVa
Lynx Geosystems Inc.	LyGe
Michael Cullen and Associates	MiCu
Placer Dome Inc.	PlIn
Placer Dome Canada Ltd.	PlDo
Quinsam Coal Corporation	QuCo
Quintette Operating Corporation	QuOp
Stohtert/Veco	StVe
Westmin Resources Limited	WeLt

Manitoba/Manitoba

Hudson Bay Mining and Smelting Co. Ltd.	HbMs
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New-Brunswick/Nouveau-Brunswick

Neill and Gunter Limited	NeGu
Noranda Mining and Exploration	NoMi
Noranda Mining and Exploration Inc.	NoMi

Potacan Mining Company	PoMi
Potash Corp. of Saskatchewan Inc.	PoCo
Three-D Geoconsultants Ltd.	ThGe

Newfoundland/Terre-Neuve

Iron Ore Company of Canada	IrOr
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NorthWest Territories/Territoires du No

Echo Bay Mines Ltd.	EcBa
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Nova-Scotia/Nouveau-Écosse

Cape Breton Development Corp.	CBDe
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Ontario/Ontario

Algoma Steel Inc.	AlSt
Barrick Gold Corporation	BaGo
Falconbridge Ltd.	FaLt
Golder Associates Ltd.	GoAs
Hemlo Gold Mines Inc.	HeGo
Hudson Bay Mining and Smelting Co. Ltd.	HbMs
INCO Ltd.	INLt
Kinross Gold Corp.	KiGo
Miller Minerals	MiMi
Mining Resource Engineering Limited	MiRe
Mintronics Systems Corporation	MiSy
National Compressed Air Canada Ltd.	NaCo
Placer Dome Canada Ltd.	PIDo

Teck-Corona Operating Corp.
YUTECHnologies

TeOp
YUTE

Quebec/Québec

Agnico-Eagle Ltée
Billiton Metals Canada Inc.
Cambior inc.
Dux Machinery Corporation
Industries de câbles d'acier Ltée
La mine Niobec
Laboratoire Chrysotile inc.
Machines Roger International Inc.
Mines et exploration Noranda inc.
Placer Dome Canada Ltée
Ressources Meston inc.
Ressources MSV inc.
ROCTEST Ltd.
Stratmin Graphite Inc.

AgEa
BiMe
CaIn
DuMa
Inde
Lami
LaCh
MaRo
NoIn
PiDo
ReMe
ReMS
ROLt
StGr

Saskatchewan/Saskatchewan

Agrium Inc.
Potash Corp. of Saskatchewan Inc.

AgIn
PoCo

Yukon/Yukon

New Era Engineering Corporation

NeEr

PUBLIC SECTOR/SECTEUR PUBLIC

Alberta/Alberta

Alberta Research Council	AlRe
Geological Survey of Canada	GeSu
The Laser Institute	ThLa
Western Research Centre	WeRe

British Columbia/Colombie-Britannique

B.C. Geological Survey Branch	BCGe
Ministry of Employment and Investment	MiEm

Nova-Scotia/Nouveau-Écosse

Natural Resources Canada	NRCa
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Ontario/Ontario

Atomic Energy Control Board	AeCb
Elliot Lake Research Station/ MNDM	MnDm
Ministry of Northern Development and Mines	MiNo
Natural Resources Canada	NRCa
Ontario Ministry of Environment and Energy	OnMi
Ontario Ministry of Labour	ONLa

Quebec/Québec

Centre de recherches minérales	CeRe
IRSST	IRSS
Ministère des Ressources naturelles	MiRe
Ressources naturelles Canada	RNCa

Ressources naturelles Canada

RNCa

UNIVERSITY/UNIVERSITÉ**Alberta/Alberta**

University of Alberta

UnAB

British Columbia/Colombie-Britannique

University of British Columbia

UnBC

Nova-Scotia/Nouveau-Écosse

Technical University of Nova Scotia

UnNS

Ontario/Ontario

Laurentian University

LaUn

Queen's University

QuUn

Quebec/Québec

École Polytechnique

ÉcPo

INRS Géoressources

INRS

McGill University

McUn

Université de Sherbrooke

UnSh

Université Laval

UnLa

Saskatchewan/Saskatchewan

University of Saskatchewan

UnSK

**DEFINITION OF INDEX CATEGORIES/
DÉFINITION DES CATÉGORIES DU RÉPERTOIRE**

MINE INDEX CATEGORIES

1. **ADMINISTRATION**: Mine Administration includes manpower training and development, health and safety of employees, management organization, voice communication, data communication, remote monitoring and labour relations.

2. **FEASIBILITY**: Mine Feasibility includes economic studies, mine evaluations, cost estimations and other projects undertaken to determine the potentials success of major capital expenditures to develop a new mine, rehabilitate an old mine or expand an existing mine for increased production or better productivities.

3. **SURFACE TECHNOLOGY**: Surface Technology includes prospection, exploration, sampling, modelling, geostatistics, hydrology and geotechnology. It will also include projects dealing with environmental subjects, waste management, dewatering and other site work such as roads, bridges, dams and runways.

4. **DESIGN**: Mine Design includes selecting stope and pillar patterns and mining methods for new mines or for existing operations that are to be modernized or expanded. The category also includes planning, scheduling and grade control.

5. **EQUIPMENT**: Equipment includes equipment design, selection and maintenance as well as installed and consumable supplies.

6. **DEVELOPMENT**: Development includes methods of advancing mine and stope access headings leading to the fragmentation and removal of the muck to the haulage system.

7. **PRODUCTION**: Stopping includes operational topics such as fragmentation, blast pattern design, drilling methods, explosives and all other matters connected to preparing a block of ore, either a stope or a pillar, for drilling and blasting and removal of the fragments to the haulage system.

8. MATERIAL HANDLING: Materials Handling includes the movement of fragmented material, from stope or development heading, via loading/transportation systems, grizzlies, rock-breakers, ore passes, crushers, surge and storage bins and loading pockets to surface.

9. SERVICES: Mine Services include ventilation, surveying, compressed air, dewatering systems, air heating, hoisting plant (hoist, headframe, shaft conveyances and all shaft installations) and electrical supply, control and distribution.

10. GROUND CONTROL: Ground Control includes rock mechanics studies, ground support mechanisms and ground support preparation, placement and installation.

11. HIGH TECH: High Tech includes computers, robotics, water jets or other new and innovative systems.

12. PROCESSING: Processing includes general milling operations, mill recoveries, concentrate grades, reagent consumption, etc., as well as in-situ and heap leaching operations on surface or underground, and recovering economics values from tailings and waste dumps.

13. HEALTH & SAFETY: Includes mine ventilation technology, health and safety studies on mining equipment and radiation studies.

CATÉGORIES DU RÉPERTOIRE

1. **ADMINISTRATION**: Inclut l'entraînement du personnel, santé et sécurité des employés, communication orales, transmission de données et relations de travail.
2. **FAISABILITÉ**: Comprend les études économiques, évaluation minière, estimation des coûts et autres projets entrepris afin de déterminer le succès potentiel d'un investissement majeur pour développer un nouveau gîte, réouvrir une ancienne mine ou l'expansion d'une mine déjà existante afin d'accroître la production ou la productivité.
3. **TECHNOLOGIE DE SURFACE**: Prospection, exploration, échantillonnage, modélisation, géostatistique, hydrologie et géotechnologie. Comprend également les projets touchant l'environnement, disposition des résidus miniers, drainage et autres travaux de surface tels: routes d'accès au site, ponts et digues.
4. **CONCEPTION**: Inclut la configuration des chantiers et piliers et les méthodes de minage pour des nouvelles mines ou pour des opérations à moderniser ou expansionner. Cette catégorie inclut en plus les activités de planification, cédulation et ajustement des teneurs.
5. **ÉQUIPEMENT**: Inclut la conception, la sélection et l'entretien d'équipement mobile ou stationnaire et pièces.
6. **DÉVELOPPEMENT**: Méthodes de développement des accès dans la mines et aux chantiers, et moyens de briser et évacuer la roche dans le système de halage.
7. **PRODUCTION**: Inclut les opérations de minage telles: fragmentations, conception de patrons de sautage, méthodes de forage, explosifs et autres opérations reliées à la préparation d'un bloc de minerai pour forage, sautage et manutention du matériel dans le système de halage.

8. MANUTENTION DES MATÉRIAUX: Inclut le mouvement du roc fragmenté à partir des chantiers ou ouvrages de développement, via systèmes de transport/chargement, grizzlis, marteaux pneumatiques, cheminée à minerai, concasseur, silos, à minerai et points de soutirage jusqu'en surface.

9. SERVICES: Ventilation, arpentage, air comprimé, système de drainage, chauffage de l'air, chambre de treuil (treuil, chevalement, installations du puits), système de distribution et contrôle électrique.

10. SOUTÈNEMENT: Inclut les études en mécanique des roches, soutènement minier, préparation au soutènement et installation du soutènement.

11. TECHNOLOGIE DE POINTE: Inclut l'utilisation des ordinateurs, la robotique ainsi que tout autre sujet d'innovation.

12. MINÉRALURGIE: Inclut le traitement en général: récupération, teneur des concentrés, consommation de réactifs, etc. Comprend également la lixiviation en place ou en tas à la surface ou en souterrain, de même que la récupération de valeurs économiques contenues dans les haldes des stériles et bassins de résidus.

13. SANTÉ ET SÉCURITÉ: Inclut la technologie de ventilation minière, étude de santé et sécurité de l'équipement minier et études de radiation.

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**COMMENT SHEET AND QUESTIONNAIRE/
FEUILLE POUR COMMENTAIRES
ET QUESTIONNAIRE**

Comments:[illegible]

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Commentaires:[illegible]

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PROJECT INFORMATION/INFORMATION SUR LE PROJET

Name/Nom:	
Position/Poste:	
Organization/Organisation:	
Address/Adresse:	
Telephone/Téléphone:	Fax/Télécopieur:

PROJECT CATEGORIES / CATÉGORIES DE PROJET

1 Management Administration	2 Feasibility Faisabilité	3 Surface Technology Technologie de surface	4 Design Conception
5 Equipment Équipement	6 Development Développement	7 Production Production	8 Materials Handling Manutention des Matériaux
9 Services Services	10 Rock Properties Propriétés du roc	11 Ground Control Soutènement	12 High Tech Technologie de pointe
13 Health & Safety Santé & sécurité			

Project Description/Résumé du projet

Title/Titre:
Description/Description:

Please return to/Prière de retouyrner à : Attention/aux soins de : André Bover

Tel/Tél: (613) 947-8669; Fax/Tél: (613) 947-1200

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